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"THREE DAY
LOAN"

Land Reclamation

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ENVIRONMENT VIEWS

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Alberta
ENVIRONMENT

Introduction: Susan Mayse

Reclamation — Repaying a Debt to the Land

New technology allows us to heal surface disturbance scars.

Energy defines the twentieth century. "In many ways, North America's economic and social well-being," says the Soil Conservation Society of America in a 1981 position statement, "rests on a mineral and fossil fuel foundation."

But energy, however carefully we use it, still has to come from somewhere. Usually it comes from under our feet, from mines that scrape away or delve beneath earth's tender skin.

Scars on the land are the cost of extracting coal, oil, or gas. At the turn of century when mining boomed into Alberta's coal belt, the last thing on anyone's mind was applying either salves or surgery to the province's damaged face.

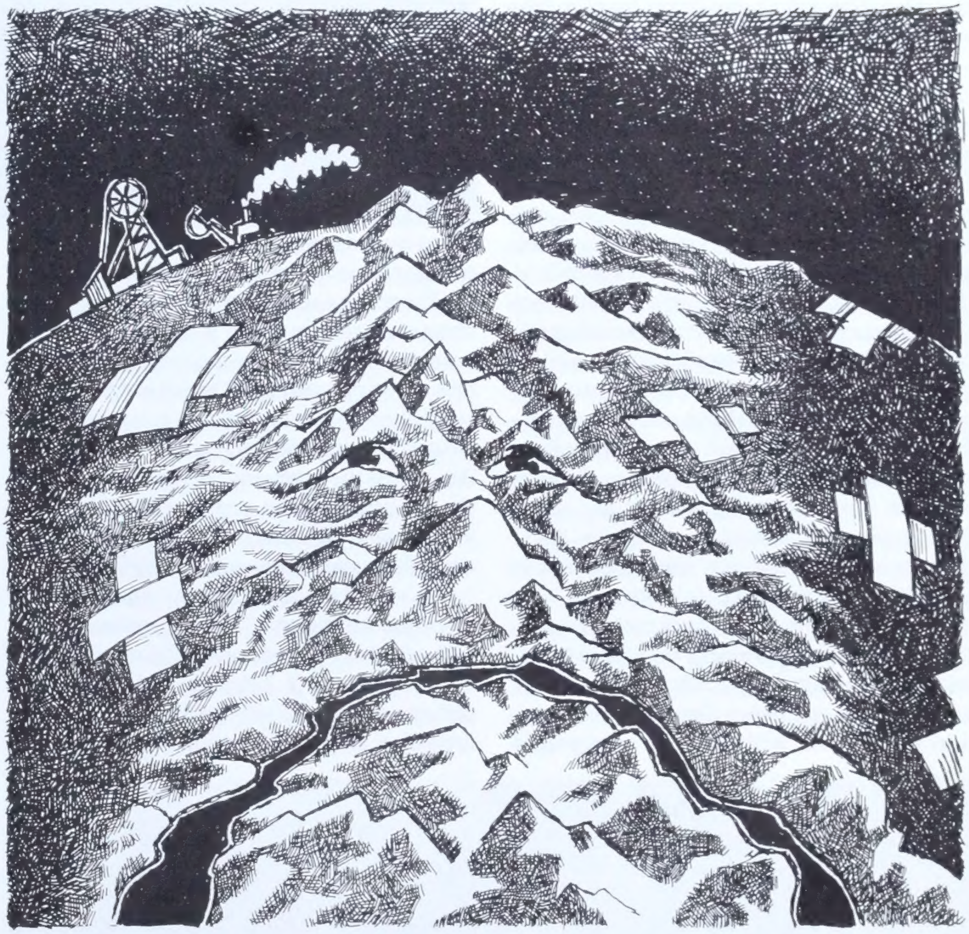
Times have changed. Now when industries slice through earth's crust they operate carefully, and when they're finished they bring in the healers.

Land reclamation and surface disturbances — mostly related to energy exploration and exploitation, but also from mineral extraction, highway construction, water resource projects — are now considered part of the same procedure, ethically and legally.

The concept of reclaiming land has evolved gradually, and still remains open to definition by experts and legislators rather than by time-honoured tradition. Land reclamation in Alberta is a phoenix of a different feather from land reclamation in Montana, or West Germany, or British Columbia.

Alberta regulations, introduced since 1973, regard reclamation as a process to restore land after a surface disturbance to a "level of productivity equal to or greater than that which existed prior to development." It's often technically difficult to fulfil, and always expensive, but industries are no longer given the choice. If companies want to operate in Alberta, they must plan rigorously for post-disturbance reclamation and land use.

Quick to respond to public pressure, Alberta has followed worldwide trends in stewardship of natural resources, including the land as a whole.



"You ought to consider land as a resource that may be yours for a time but is also held in trust for the future. Land is not a commodity that any of us can own in the ordinary sense of the word," writes British environmentalist Graham Ashworth.

"If you are presently trusted with the management of a piece of land, you ought to use it in a manner that benefits the land and does not damage it. Some land uses are abuses that have irreversible consequences, and you ought to avoid such abuses."

End-use or post-disturbance use is the main determing factor in reclamation, and it can be a thorny matter. Counties and municipalities have the final say in end-use — how the land will be used in 25 years, and 50, and 100 — and developers must cooperate. Various interests are sometimes at odds with each other (see 'End-Use,' page 9), pressing for wildlife, recreational, industrial or other uses. Different end-uses mean different approaches to reclamation. Will the land be left in hillocks for wildlife cover? Will it be levelled and topsoil carefully replaced for prime agricultural use? How meticulously must groundwater be restored to prevent pollution of nearby lakes or rivers? Different answers can mean millions of dollars in costs.

Alberta's Land Surface Conservation and Reclamation Act and related regulations permit flexibility, yet cover the field thoroughly by insisting on post-industrial attention to every aspect of land conditions, and human, wildlife and agricultural use. The

consideration which can draw most public reaction is also included — aesthetics.

Before a company can turn a shovelful of earth, it must file an 'application for development and reclamation approval' with the provincial Development and Reclamation Review (D & R) Committee (see 'Roadmap,' page 19). The applications are complex, demanding several interlocking studies: soils, groundwater, surface water, geotechnical (landform) conditions, community land use, vegetation and wildlife. Even archaeological-historical interest comes under consideration by the D & R committee representing 10 government agencies. Human history underlies industrial development surprisingly often, since a Blackfoot hunting part in 1800 is likely to have crossed a river at the same ford a pipeline company selects in 1981. 'Rescue archaeology' may then uncover the past before it's displaced forever.

The development and reclamation application may cost a developer up to two years, and half a million dollars, about a quarter of which can be attributed directly to reclamation studies. But without it no approval is given by the environment minister — and if no approval is given, no development begins.

There are exceptions, says Dennis Lang, chairman of the D & R committee. If a company has filed an incomplete application, the approval may be granted with the condition that mining or reclamation be carried out in a way the government specifies, unless the company comes through with the missing study to propose an acceptable alternative. Conditions may be stringent enough to spur applicants to action.

"We're likely to err on the positive side, from our perspective," says Lang, using topsoil salvage as an example. "If it's a matter of whether four (1.2 metres) or five feet (1.5 metres) should be salvaged, we're likely to order five, subject to them proving they only need four. If you err on the other side there's no way to make it up — often it's a permanent mistake."

Alberta Forest Service

Once approvals are granted — as thirty-odd have been since 1973 — the industrial developer must put up cash or bonds to cover the cost of reclamation in the event of permature abandonment. For coal strip-mines, the foremost site type in Alberta, the basic security is around $100,000; for oil sands development, around $250,000. Added to this are fees accrued during mining, which may add to a total cost of $2-16 million (coal) or $30 million (oil sands).

Naturally there have been snags, and resistance to such a demanding and cost-producing body of legislation. Some mining engineers look back fondly on the fast-and-dirty days of getting coal or minerals out as cheaply as possible and leaving the site unreclaimed.

"It's a resistance to change," says Dennis Lang. "Wherever there's a significant cost involved there's a significant resistance to taking the action."

Flexibility is the keynote in the D & R committee's approach to clearing applications. The system encourages developers to offer their own solutions to reclamation for committee acceptance. In contrast, American federal law lays down extremely specific guidelines for what is and is not acceptable in reclaiming disturbed land. Industry representatives, despite some friction, appreciate the Canadian approach.

"This is a new technology, and therefore we're both feeling our way along," says Bill Smith, a vice-president of Calgary Power which operates two surface coal mines to fuel power generators. He gives Alberta Environment and the D & R committee "full credit" for environmental protection, but is

eager to point out Calgary Power practiced land reclamation well before the government required it.

"We're proud we were reclaiming the Whitewood mine before there were any regulations. We've always led the field."

Costs of land reclamation are passed on to utility customers. Shareholders are generally assured a rate of return, but Smith says the company seeks to shield customers — who lack that outside protection — from unnecessary expenses.

Calgary Power has challenged D & R committee conditions and regulations several times. Reclamation costs are high now — $10,000 or more per hectare of land with a market value of $1000 — and could triple if government demands were follwed automatically, Smith maintains.

Alberta reclamation standards are impossibly high, some companies feel, but this is a short-term view, cautions Lang. Immediate reclamation costs might seem high compared to present land prices, especially for a non-commercial purpose such as wildlife habitat. But land use changes from generation to generation, and reclamation should offer many options for future land use.

"The cost of reclamation is going to be recovered forever and a day afterwards," Lang points out, "whereas the market value is just today's measure."

Not all developers agree.

It is possible to obey the letter of the law without carrying out full and enduring reclamation. A company could overfertilize and overseed badly-reclaimed land long enough to produce a lush grain crop, until it sold to a farmer whose ordinary crops might soon fail. A coal mine could inobtrusively dump its soil heap into a major river system.

Lobbying by industry for easier regulations could also be a concern. Structures like the D & R committee are largely functions of provincial civil service, and are theoretically vulnerable to political decisions.

Even among agencies working together to set and enforce regulations, there are different perspectives. Environment, wildlife and forestry interests on the D & R committee, for example, may call for minimal surface or underground mining of a coal site to reduce the overall environmental impact.

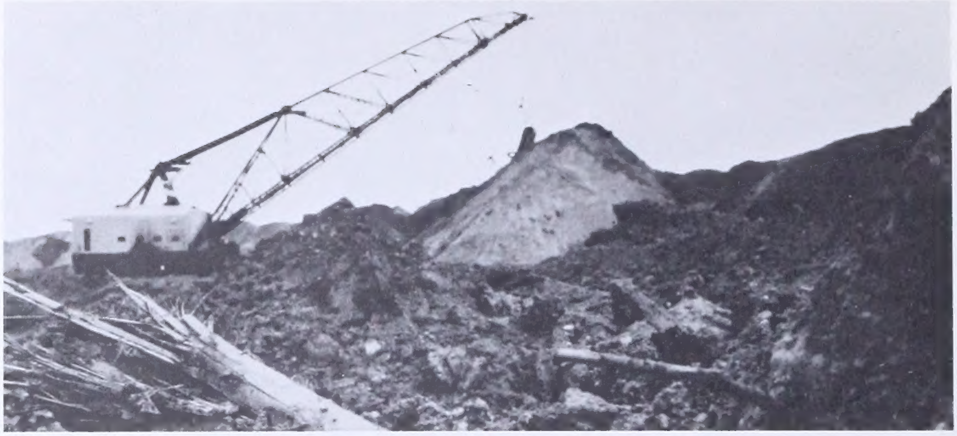
At the same time, members from the government's Energy Resources Conservation Board may voice the ERCB mandate under the Coal Conservation Act to ensure provincial coal resources are not wasted — by recommending intensive strip-mining to extract every cubic metre of coal from the site. Since mined-and-reclaimed areas are unlikely to be re-opened in the foreseeable future, the ERCB approach may take precedence.

Land reclamation is indeed a new technology. Definitive textbooks are still being written, engineering solutions are still on the drawing board, vegetation inventories are still green.

Alberta can to some degree draw on the experience of American developers working in similar terrain — particularly Montana, Wyoming, and North Dakota — and on the advanced land reclamation of West Germany's Ruhr Valley. Nevertheless, there's a profound need for research into the reclaimability in the province's three main ecological zones (see 'Research', page 30).

Here, Alberta's Heritage Trust Savings Fund comes into its own. Since 1977 the fund has offered up to $5 million a year, to underwrite government reclamation of old abandoned sites and reclamation research. To date about $11 million has been spent, and the five-year project may be renewed after 1982.

Alberta Forest Service



Research is in eager mid-stride under the watchful eyes of the Reclamation Research Technical Advisory Committee (RRTAC), but the first pressing need of the province's researchers was to identify priorities in the three regions — plains, mountains-foothills, and northeast Alberta.

Plains — how quickly does **groundwater** recover from the effects of strip-mining? At worst, soil salts may evolve rapidly and produce groundwater as salty as the sea. At best, groundwater may regain its balance readily without permitting salt to build up. In some cases alternate aquifers (underground water channels) can also replace those irretrieveably lost to mining.

Soil reconstruction is costly but necessary. How much topsoil is needed, how much subsoil or till is required for good crop growth?

Fly ash and **bottom ash** are byproducts of coal combustion in power generating plants. How should they be handled, and do they offer commercial potential?

***Mountains-Foothills* — revegetation** potential in foothills forest and alpine areas is almost unexplored territory. When are **reconstructed soils** and the plants growing on it self-sustaining? How effective are **native plant species** in mountain reclamation compared to introduced species? How can **erosion** by wind and water be minimized in delicate high-altitude sites? What **land contours** and revegetation will **wildlife** accept? How steep can a **spoil heap slope** be before it endangers plant and animal life?

Northeast Alberta — how can toxic **tailing ponds** (see 'Oil Sands' page 22) be safely maintained. How can soils be developed on sand tailings which can support **forests?**

RRTAC members, drawn from provincial departments and the Alberta Research Council, regularly update research priorities and review proposals from the many industry and public agencies engaged in research. From April 1981, the non-profit Coal Mining Research Centre located at the University of Alberta will also add materials handling aspects of reclamation research to its current studies in coal recovery and mine safety.

Old abandoned surface disturbances, the other group of projects funded by the Heritage Trust, are mainly early coal mines and sand-gravel pits. About $3.7 million has already been spent on this segment of the program, restoring industrial sites on public lands whose developers or former owners are not in a position to carry out reclamation. Some of the sites date from the last century. Reclamation has been so energetic that Energy and Natural Resources researchers have occasionally had to elbow reclamation workers aside to keep some unreclaimed land for their test plots.

Not all reclamation follows mining or other industrial development. Environment's water resources branch restores land around

an assortment of reservoirs from livestock watering ponds to the huge irrigation supply of St. Mary Reservoir, says Ron Middleton of Environment's planning division.

Native plants are a secret weapon here also, even if one botanist hired from a wetter climate glanced around and asked "What native plants?" The dryland grasses and shrubs of the area may have the most important role in reclaiming banks and recreation areas near the water sites.

About $155,000 of research to culminate in 1982 includes gathering and propagating native species, and experiments with replanting. For example, planting trees deeper than normal and in sheltered places increases their hope of survival in the harsh climate of southern Alberta.

Psychology also plays its part in water resource reclamation, says Middleton. Sometimes planting prickly rose bushes across a well-trodden fishermen's path is the only way to keep anglers from dangerous water or seriously-damaged landscape.

Delicate ecological zones, alpine regions of parks for instance, present their own reclamation problems. Compaction of thin topsoil and trampling of native species with a tenuous hold on life anyway are the main problems, and solutions include careful redirection of park users toward more stable spots.

Difficult, costly, troublesome. But it *can* be done.

Land reclamation's success in Alberta is a message of potential and reassurance for those who despair at growing energy use, diminishing resources, and what they may perceive as industry indifference. Industry — with an occasional prod from legislation and public interest organizations — is by no means indifferent.

Land reclamation represents billions of dollars, and that's one sure way to attract industry attention. It also has a history of provoking public response which can easily cost companies credibility, development approvals and precious time. Land reclamation is an 'image' issue.

Developers responded to public and government pressure a few years ago by hiring environmentalists to advise on ecologically-sound resource development and reclamation. A stratagem, claim cynical observers, designed to reassure the folks of company concern about the environment — but even the cynics admit the idea somehow magically took root and produced a bountiful harvest. Companies not only appear to care. They genuinely do care.

Our energy use is enormous, and of debatable value; but it is, for now at least, a reality. Our best means of minimizing the impact of surface disturbances — and keeping the earth whole, healthy and beautiful — is careful land reclamation.

Dr. David Walker, University of Alberta

Susan Mayse is the freelance acting editor of this magazine.

VIEWPOINT

Andrew Vaughan

Anton Schori

Land reclamation will become more important with increased surface disturbances.

Man has always had an impact on land.

In the past undesirable impacts, or disturbances, were considered acceptable for three main reasons. There was a lack of understanding of the long-term consequences of disturbances, disturbances were considered acceptable, or the short term benefits outweighed the long term costs.

In recent years interest in reclamation of disturbed land has increased dramatically. This interest is due in part to a better understanding of long-term consequences, different attitudes regarding acceptable consequences and the consideration of intangible factors in cost/benefit analysis.

There is general agreement that reclamation of disturbed land is desirable and necessary. This is evident since almost all provincial and state governments in Canada and the U.S. have some form of reclamation legislation. Why then is there so often disagreement between the developer, the public and the regulatory agencies concerning the specifics of reclamation?

Several questions arise. What precisely is reclamation? How should standards be determined? Who should pay for it? What direction should future reclamation activities take? Is reclamation viewed in the proper perspective?

These questions must be addressed in order to eliminate emotion from the reclamation question and to provide a basis for clear understanding.

What is reclamation? The developer and the naturalist may envisage very different concepts. The National Academy of Sciences in 1974 suggested definitions for the terms restoration, reclamation and rehabilitation. Loosely and briefly translated, restoration means that original conditions are established. Reclamation requires that original productivity be restored, and rehabilitation means that land will be returned to an agreed standard. Rehabilitation is generally the only practical alternative. True restoration is usually impossible. Reclamation requires a measurement of original productivity and a prediction of specific requirements to reestablish such productivity; both are very difficult to assess accurately, particularly where soil management (for example, agriculture) is involved. It is unrealistic to argue that land should be returned to original productivity in cases where the requirements cannot be clearly established.

How should standards be determined? Standards should be in the form of guidelines, rather than regulations, to allow flexibility. Government regulatory agencies must recognize that for all practical purposes reclamation is actually rehabilitation (terms used synonymously in this discussion). Standards must not be established independent of cost considerations; therefore standards need to allow for different levels of reclamation since acceptable costs may vary from one location to another.

Who pays for reclamation? The consumer pays! It must be recognized that increased costs of production — and reclamation is a cost of production — must be borne by the consumer. Some may argue that more stringent reclamation standards should apply in cases when the product (for instance coal or energy) is exported rather than utilized domestically. This agreement does not recognize that Canada's economy depends heavily on foreign trade and the export of raw materials, and thus reclamation costs must be realistic.

What direction should reclamation efforts take in future? Land disturbance, particularly coal mining, may increase dramatically in future. Mine reclamation will thus become more important. It will be directed primarily by efforts in the areas of regulation, methodology and the corporate approach.

Regulatory agencies must consider the cost implications of reclamation guidelines and standards and therefore allow for different levels of reclamation. In regions where large areas are expected to be disturbed, such as the Athabasca oil sands area, a regional land use plan must be developed. This will allow guidelines to be applied in a consistent and rational manner.

Reclamation methodology has emphasized the revegetation of disturbed surfaces. Research must continue, but the emphasis should be shifted to the area of materials handling to ensure that reclaimable surfaces are created. Materials handling for excavation must be incorporated into materials handling for reclamation. Mining must come to mean not only excavation (or extraction) but excavation and reclamation.

The corporate structure of all resource development companies must allow input from reclamation specialists at all levels — operations, planning and senior management. This would be the most effective single way to improve present reclamation practice.

Does society have a proper perspective on reclamation? Reclamation is an emotional subject because land disturbances are highly visible. However, to date only about .01 per cent of Alberta has been disturbed by surface mining. This is less than one quarter of the area of the city of Edmonton.

Good reclamation practices are essential. The limited areas disturbed by mining, however, must be viewed in the same perspective as the very considerable areas of farmland which are lost permanently due to poorly planned urban growth, and prairie soil productivity lost due to depletion of organic matter and soil salinization.

Anton Schori is leader of environmental sciences with Techman Engineering Ltd. of Calgary.

by Brian Tucker

What Will the End-Use Be?

Everyone concerned has a different answer.

Andrew W. Vaudry

Reclaiming land can be like staging a morality play — so many different values must be considered.

Government, industry and interest groups in the community all play key roles in determining how reclaimed land is used — for industry, agriculture, recreation, wildlife, residences.

Let's describe the stage setting.

Lake Wabamun, about 80 kilometres west of Edmonton, is girded by coal deposits on the north, south and west. Calgary Power Ltd. has two mines, Whitewood and the newer Highvale, that produce about nine million tonnes of coal a year. The Whitewood coal mine, just north of the lake, is one of the first coal projects in Alberta where reclamation was required.

Before mining, the Whitewood area was mostly muskeg with some marginal farmland. After the huge draglines had clawed it up, the site resembled a lunar landscape —grey spoil heaps with jagged peaks like ugly scars.

Calgary Power levelled the site and planted alfalfa and rapeseed on 40 hectares. This was an initial reclamation step to prevent erosion and build up organic material in the soil. On test plots, the company conducts research into how land might be reclaimed for agriculture.

Calgary Power still has no government-approved reclamation plan; regulations have tightened with social concern, and the company has been asked to submit new proposals. A broad reclamation plan submitted by Calgary Power in 1978 is still being considered by Alberta Environment.

Dennis Lang

Government is cast as guardian of the mined land. It creates and enforces reclamation standards and tries to protect the public's interests through its legislation the 1973 Land Surface Conservation and Reclamation Act. The Coal Policy of 1976 sets out guidelines companies must follow when they strip mine coal.

At one time, government stressed returning land to a specific use. Now 'usefulness' is the key, so that a range of potential uses remain after mining.

Dennis Lang, chairman of the development and reclamation review committee in Environment, says; "Our intent is to see that the county or municipality — whoever has the authority to determine land use — has the same kind of choice for the use of the land as it did before."

The government encourages developers to get public advice on future land use. In some cases (for example, the Keephills power project) a public advisory committee was made a mandatory part of the development permit.

The Wabamun Land Use Advisory Committee was probably the first advisory group established in conjunction with a coal project in Alberta. Set up in 1975, the committee consisted of representatives from villages in the area, cottagers, farmers, the Edmon-

Andrew Vaughan

ton Regional Planning Commission, the County of Parkland and Calgary Power, plus four advisory members from the provincial government. Alberta Environment 'facilitators' counsel both public and industry on good communications.

For the coal mining company reclamation is a costly, long, often frustrating process, without financial return for the company, unless it plans to keep the land. And utilities have said they don't want to become major landholders.

Calgary Power's goal is to keep its reclamation costs as low as possible while meeting the regulations, says Dr. John Railton, manager of environmental planning for the company. The reclamation guidelines says the land must be at least 'as good as' it was before mining, or 'better than' if possible. Calgary Power says making the land 'better' than it was would be unjustified.

"It would be asking a small segment of the population (power customers) to stand behind the cost of improving land. We feel you should have to spread the costs around more if you want to do that."

What constitutes 'as good as' is often a judgment call, says Lang. If land was farmed before mining, it's fairly easy to compare crop yields. But in an area such as Whitewood mine, where former wildland will take many years to revegetate, you must use some other yardstick — such as soil characteristics or drainage patterns.

Calgary Power says it has difficulty understanding the government's requirement to keep land capability as flexible as possible, and wonders how land can be reclaimed for a wide range of uses.

Lang says Calgary Power has yet to prove the land has the same potential for future uses as it did before mining.

For example, reclaiming to a gently rolling landscape with some shrubs and trees allows for agricultural, residential, industrial or wildlife use. Before current regulations took effect, developers were only required to knock down part of the spoil piles and seed the slopes to prevent soil erosion. Now, they're required to level the land so it is no steeper than before mining — in the prairies, usually this means gently rolling terrain.

But Calgary Power's Railton counters, "What does gently rolling terrain mean? We're looking for some communication explicit enough to act on. We haven't got that yet."

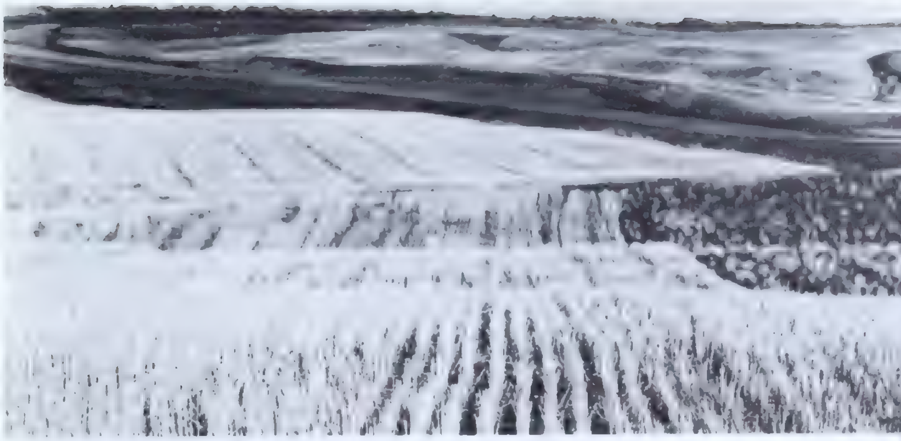
Whitewood started mining in 1962. By the end of 1980, an estimated 704 hectares of land had been stripped. Reclamation work had started on 440 hectares, with the rest gravel storage (206) and unreclaimed land (58).

Another major character in this 'morality play' is the farmer, who sees a world struggling to feed millions of starving people. Yet farmland in North America is being lost to expanding cities and industry. Agriculture will always be a mainstay of Alberta's economy. Unfortunately, many Alberta coal deposits are under good farmland.

By salvageing enough good topsoil, you can recreate soil conditions as they were before mining, says Lang. Steep slopes must be levelled to allow farmers to use machinery. Moving and replacing soil and levelling land makes up 90 per cent of reclamation costs.

Wilf Cody, a district agriculturalist for the provincial government, says the reclaimed area remains too hilly and rocky to grow cereal grains. It might make good pasture land, though.

"It depends upon how desperate you are



Andrew Vaughan

grain production on reclaimed land

for land. When I look at land use across the province and see how we're wasting good land, I can't really say we should spend a lot of money to reclaim less good agricultural land (such as the Whitewood mine)."

Cody is sceptical about the productivity of reclaimed land. "I don't believe you can duplicate in 10 years what it took nature millions of years to do."

Wildlife habitat is another diminishing resource. Wildlife thrive in a diverse landscape of rolling hills, trees and sloughs — unlike farming. But with proper management, agricultural and wildlife uses can coexist, says Bruce Stubbs, a development officer with the wildlife division of the department of energy and natural resources.

Moose have trouble adapting because they need larger areas of bush and don't eat grain. But deer and ruffed grouse thrive in farming areas when some trees are left. The open grassland provides grazing for deer and browsing for grouse; trees provide escape cover, food and shelter.

Reclaiming land for wildlife is probably the cheapest for of reclamation, says Stubbs. It's easier to reclaim land with a variety of vegetation, rather than planning monoculture, with its weed problems.

Land ownership after the mining company gives it up is important. If land reverts to public ownership, the government retains more control over wildlife habitat than under private owners.

Meanwhile, the Stony Plain Fish and Game Association hopes to enlarge its 10-acre plot in the Whitewood reclamation area, contoured and seeded by Calgary Power to alfalfa and sweet clover. The association has planted a few thousand trees and shrubs over the past five years. Most have survived, despite rodent damage. Yearly surveys have turned up white-tailed deer, plus rabbits, ruffed grouse, coyotes, skunks, badgers and porcupines.

Lake Wabamun is within commuting distance of Edmonton, and demand for its rural residential land is expected to grow. Already one housing development, Brookside Estates, borders on the northeast corner of the mine area. Land reclaimed for housing should be relatively flat for economical installation of water and sewage systems, although many urbanites dream of a gently rolling, treed setting.

Bruce Stubbs

Some industrial uses may have to be ruled out on the reclaimed Whitewood mine, says Lang. Spoil is more porous than packed soil, so any chemical spill would quickly seep into the ground. This could pollute ground water and, ultimately, Lake Wabamun. Also, septic tanks seepage from some housing projects might also pollute the local water supply, so septic tanks would have to be limited.

County of Parkland reeve Les Miller sees great potential for industry in the Lake Wabamun area because of the nearby power plants.

"Better to use reclaimed land for industrial purposes than good black soil around cities that is often use now," Miller says.

Extensive gravel deposits on the reclaimed land may also attract industry.

For Edmonton residents, the heavily-used recreation facilities at Lake Wabamun are only 80 kilometres away. With the Edmonton area population expected to double in the next 20 years, and transportation costs rising, Lake Wabamun will be used even more extensively. Alberta Recreation and Parks has an eye on the Whitewood area as

Lauren Dale

a possible satellite recreation facility for the heavily-used provincial park at the lake's east end..

Stuart Loomis, of the outdoor recreation planning branch, says "creating a park is not an easy way out of doing a proper reclamation job.

"To have a good park, you've got to be able to grow things, have good water quality and good soil."

Park officials hope Calgary Power will do some specialized reclamation. No major smoothing of spoil piles would be necessary for one area, making it a relatively cheap reclamation job. Some topsoil would have to be salvaged so shrubs and trees could provide cover for wildlife. This would be an interesting setting for hikers and cross-country skiers. Snowmobiles and motorbikes would have to be separated from the parking lots, wildlife and skiers. A small area —for picnic and campground sites along the Yellowhead highway — would require stringent reclamation standards: flatter terrain and a thicker layer of topsoil to cover toxic spoils, to withstand crowds of people and maintain vegetation.

The Lake Wabamun Land Use Advisory Committee agrees the area should be used mainly for recreation and wildlife.

Calgary Power's land consultant will soon sit down with the County of Parkland to discover the county's long-term plans. The company hopes to submit a final, more detailed reclamation plan by the end of this year, to be considered by the development and reclamation review committee of Alberta Environment. Ultimately, the environment minister will judge Calgary Power's plan.

Brian Tucker is an Edmonton journalist.

by David May

On the Job

Time passes quickly – if you care.

Andrew Farquhar

Our hopes for reclaimed agricultural land may lie chiefly in the hands of men like Norman Krause.

Born in Lamont, Alberta in 1926, a farmer's son and now a retired farmer himself, Krause sold his quarter section near Alberta Beach for almost 40 years only a few years ago. He's a small, quiet man with a strong grip. His reputation around Alberta Beach is for hard work and honesty.

For almost as long as he has farmed, Krause has driven a cat, clearing brush from his neighbours' land to extend the growing potential of the Gray Wooded soils around the lake area.

"When we came here, our land was rocks and clay," says his wife Gertrude. "By the time we left, Norm had filled in the holes and made it drain."

Supporting a family of seven on 65 hectares proved an impossible task for even the hard-working Krauses, who over the years developed a dairy herd, raised beef cattle, pigs and chickens "and anything else that grew." So Krause would hire himself out to neighbors, clearing brush and piling it each winter, then discing and breaking the piles each summer.

Twelve and 13-hour days were common for the farmer-catskinner, who bought his own secondhand D7 in 1961. Watching his effortless handling of one of these huge machines, you'd never suspect a cat broke his back in a 1964 accident.

For the past 18 months Krause has been catskinning for Manalta Coal under contract to Calgary Power to strip the land's 970 hectares of overburden, mine its coal and deliver it to the nearby Wabamun thermal power plant.

"They're doing the best they can with the soil here," says Krause. But it's not the greatest soil-low in organic matter and plant nutrients, with many areas covered with peat bog.

A major part of Krause's daily work is to help remove what topsoil there is and to pile it for later re-use once mining is over. Using the cat's front blade he neatly slices through the willows, aspen and poplar trees, making three cuts from the front and one from the side before driving his spoil material into windrow piles.

Then, once the brush and trees are completely cleared, he moves his 14-tonne machine into position behind a rubber-tired scraper vehicle and pushes it along until its load is filled.

Andrew Vaughan

Calgary Power believes its land reclamation work at the Whitewood mine site "provides a land surface superior to that of adjacent unmined lands," according to the company's own promotional literature. Calgary Power, however, agrees that the steeper topography left behind by mining techniques, and potassium and organic matter deficiencies in the reclaimed soil, may prove to be headaches for farmers of the future.

Calgary Power's plan here is to level out the steepest slopes, add high-phosphorus fertilizers and institute crop rotation.

But fertilizer prices have been climbing very rapidly along with the price of oil. Is such expensive fertilizing the answer for this reclaimable land?

Krause says no. A farmer can make his own black dirt, he says, by growing hay, plowing the straw back into the earth instead of burning it as waste. "It takes a few years but any farmer can do it if he wants."

His afternoon coffee-break over, Krause climbs back into the cab of his cat, adjusts the ear protectors on his hardhat and starts stripping the soil once again.

"Time goes quickly for me when I'm working," he says, "A lot don't care. And that's what makes time go slow."

David May is an Edmonton freelance writer.

by Jenny Jackson

Forestburg — Evolution of a Coal Mine

'Reclamation' is no longer a foreign word.

It was, in many ways, a naive age.

Just four years had passed since a world war that had pushed the demand for coal to new heights. Post-war Japan was consuming 9.4 million tonnes of Alberta coal every year and clamoring for more.

In 1949 it seemed to everybody, and especially to Albertans, that the future was rosy. It didn't occur to anybody that someday resources could run out. Farmland would have to be preserved.

So it's hardly surprising that when Forestburg Collieries began mining for coal in 1949, they went in, stripped off tons of good soil, got the coal and left.

Little else was done at the Diplomat mine 60 kilometres southeast of Camrose. The enormous mounds of dirt called spoil heaps were seeded with grasses, legumes and trees, but the topsoil had been turned under and the slopes were too steep for cattle to graze.

The Forestburg experience has given industry, government and science a 32-year lesson. Now, they're on the brink of discovering new methods for reclaiming land that was previously thought unsalvageable.

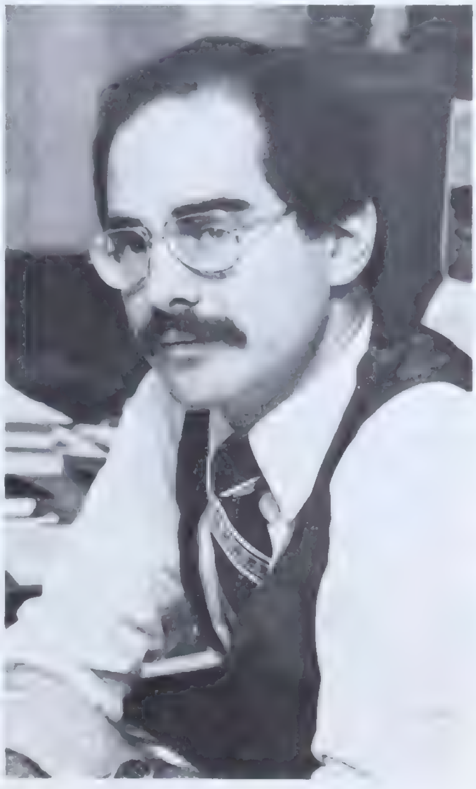
Since those naive days, much has been learned about soil ecology. It isn't just a matter of putting the soil back in the right sequence. Before one spadeful of earth is turned, miners must have a very clear idea of how the land will be used in 20 years.

Today, the Diplomat mine is almost exhausted and will probably be abandoned in 1983. But its owners, Luscar Ltd., plan a mining operation not far away, south of the Battle River at the Paintearth mine. Here, some of the most advanced reclamation techniques are now being researched.

"There's nothing like it in the world today," says Dr. Paul Ziemkiewicz, chairman of the Reclamation Research Technical Advisory Committee.

Methods of strip mining reclamation depend on the type of soils disturbed, as much as one the planning and methods used to reclaim it.

Under every field lies topsoil, subsoil and parent material with pockets of water and drainage systems. Before much was known about reclamation, these were mixed together in the spoil, often with disastrous results. Because the spoil was usually left in a huge mound, precious topsoil eroded away. Water tables were upset and nearby wells dried out or became too salty or muddy to use.



Dr. Paul Ziemkiewicz

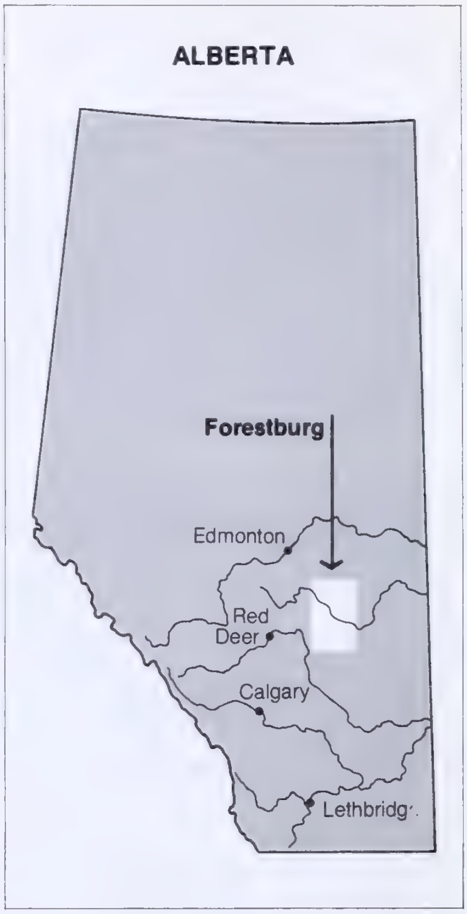
At the Diplomat mine, the subsoil is relatively good and miners were able simply to fill in the holes without many permanent adverse effects. The surface soils here are Irma and Killam loams, extending down two to three metres.

Killam loam is fairly good arable soil formed from glacial till. A dark brown loam about six inches deep, lies on top with a clay loam underneath. It does contain a fair amount of sodium, however, which can be harmful to plants.

Sandier Irma loam makes good, arable land and relatively little sodium permeates the root-bed. Underneath the loam but well above the coal, however, a layer of sodium-rich bedrock is sometimes found. If this bedrock is churned up with the Irma loam, it can deteriorate the overall quality of the soil.

As legislation toughened over the years, much repair work had to be done in the Diplomat area. From 1950 to 1966, spoil peaks were levelled slightly and planted with grasses, legumes and 25,000 trees.

In 1967 revised reclamation guidelines required that the spoils be levelled with peaks no higher than five feet. Over the next five years, 144 hectares were levelled to new standards using new, larger earth-moving equipment. Land was again seeded and about 18,000 trees were planted.



In 1973 the Land Conservation and Reclamation Act set new standards for reclamation. The land-levelling program at Diplomat was again expanded and the government went back into previously-reclaimed areas to upgrade them.

In agricultural areas, the guidelines suggested levelling slopes to less than 10^0 and also recommended that the topsoil be preserved, rather than tossed in with all the rest of the spoil. Two years later, a topsoil salvage program was begun at Diplomat and became an integral part of the mining operation.

The next year, Alberta Environment worked with the County of Flagstaff to revitalize 65 hectares that had been mined but not reclaimed. The program was established to try to restore topsoil to areas where all topsoil had been lost. The department, using Heritage Trust Fund money, also bought adjacent land and began reclamation on a further 81 hectares disturbed by pre-legislation mining. In 1977, the areas were levelled and worked over with a 'subsoiler,' a machine that helps break up earth compacted by heavy equipment. On the government's 65 hectares, sweet clover was planted and left for two summers.

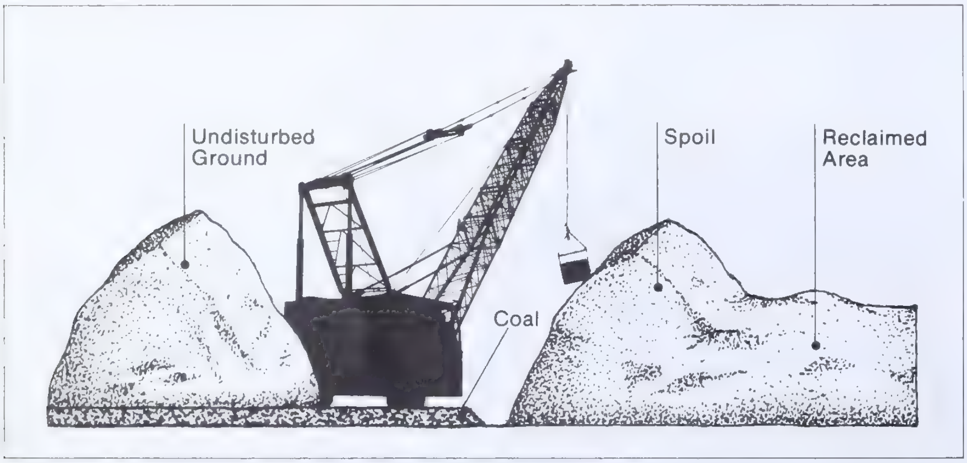
"It turned out to be quite an impressive yield," says Bill Szabon, head of Alberta Environment's reclamation branch. Tests showed the yield to be .4 tonne per hectare. The average yield for undisturbed lands is .5 tonne. The clover was turned back under to help build up fibre and organic material into the soil. Last fall, the lands were seeded with grasses and legumes. Szabon says it will take about two years to see how successful the reclamation has been. He estimates the cost at $550 per hectare — not much, he says, considering how much good agricultural use it can now support.

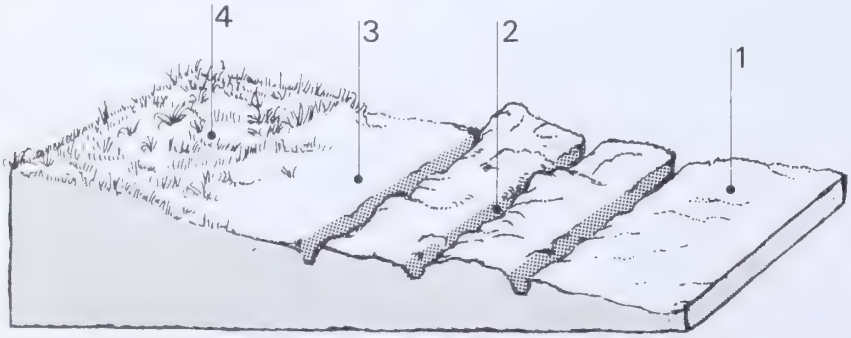
Henry Thiessen, assistant deputy minister of Alberta Environment, says, "It had quite an effect on industry. Before that, they said, 'it can't be done.' We showed them that, given funds, it can be done."

But Dennis Lang, Alberta Environment chairman of the development and reclamation review board, says if Luscar had done a more thorough reclamation job in the first place, it could have recovered its costs and made a little extra because the value of arable land has increased so much.

Today Luscar is following government-approved plans for future reclamation, including separating different types of soils, levelling and preserving proper water supply and drainage.

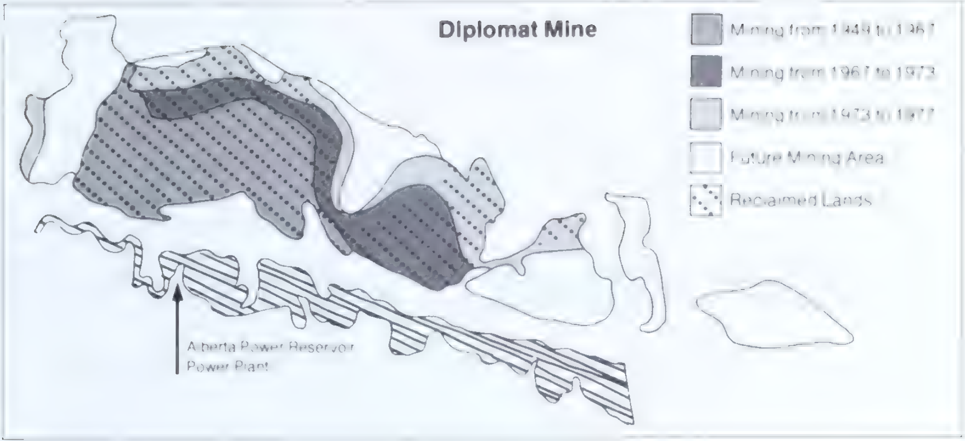
Reclamation has been relatively easy at Diplomat compared to mining operations south of the Battle River, where soils are considerably more difficult to handle. These Torlea soils have a thin coating of topsoil with extremely sticky clay underneath. Roots





Several important steps in the reclamation of a prairie mine are shown.

In the foreground (1), topsoil has been stripped off the mining area and stockpiled for later use. In area (2) spoil piles are being levelled to simulate the original contours of the land. Area (3) is ready for topsoil replacement; cultivation, seeding and fertilization will follow. Area (4) shows the early production of an agricultural crop.



cannot penetrate it, so it must be kept away from growing areas.

Luscar applied in 1978 to the Energy Resources Conservation Board for a permit to develop a mine here to replace dwindling coal production from the Diplomat mine. The coal would fuel Alberta Power's Battle River generating station which will need 3.4 million tonnes of coal per year. Forestburg Collieries is to supply up to two million tonnes per year and the nearby Vesta Mine, operated by Manalta Coal Ltd., will supply the rest. The proposed mine site contains an estimated 53 million tonnes of recoverable coal, but also has difficult Torlea soils.

Bill Szabon

Szabon said a government reclamation program on the Vesta Mine, adjacent to Luscar's proposed Paintearth mine, was disappointing.

Although this reclamation project tried to deal with the Torlea soils, Thiessen says, "We have done some reclamation but it hasn't been as successful as at the Diplomat mine."

The government tried to reclaim 65 hectares but all they could do was level the terrain, and use ash byproducts from the generating stations to aid the process. "It's been sitting there since 1976," says Szabon. "We tried some seeding and had some success there. We tried various bottom ash mixtures and had fairly good success with it. At least it can be used for a wildlife area."

Andrew Vaughan

Luscar told the 1978 ERCB public hearing that it would save the topsoil, grade the areas and either put the topsoil back or use it on other mined land. Cosidering the Torlea soils underneath, the company planned to strip and mix weathered bedrock separately, including a gypsum layer. If natural gypsum was lacking, more would be imported. Gypsum counteracts the effect of the clay, and would create a buffer zone between the inhospitable clay-like Torlea soil and the roots.

On the Killam soils, the company proposed to find out how much low-sodium material was suitable for reclamation, prestrip it and stockpile it. For the Irma soils, rebuilt soils vary in productivity

Andrew Vaughan

they proposed finding out which areas were low in sodium. These could be just overturned, with only the topsoil handled separately.

Environment didn't accept Luscar's claims that it could reclaim Torlea soils, however. Officials felt gypsum would not necessarily make a soil able to support plant growth, and told Luscar to conduct a field test program to demonstrate a suitable reclamation method. Results were to be submitted annually until they came up with the proof.

Luscar has established the demonstration plot, but the Battle River Reclamation Research Project (BRRRP) is a still bigger project. It includes staff from the provincial departments of environment and energy and natural resources, Luscar, Manalta Coal and Alberta Power. The research program, three years in the making, started work this year.

It consists of a 16-hectare series of plots to experiment with different thicknesses of topsoil, and combinations of subsoils and additives to determine what reclamation methods are necessary. Each of the 21 plots is eight by 20 metres. They will be seeded to forage crop and barley in 1981. Some plots have three metres, two, one, one-half, one-quarter and zero metres respectively of glacial till to act as a buffer zone between the topsoil and the clay.

The team is also experimenting with various depths of bottom ash from burnt coal, a byproduct of the nearby Battle River power plant, to break up the clay. The ash is high in calcium and breaks the compacted mass of clay into smaller chunks. Researchers are also trying gypsum, a more conventional material that has a similarly beneficial effect on clay.

Ziemkiewicz hopes the results of these studies will give government and industry better information to develop guidelines and instructions for reclamation.

"Ultimately we hope to be able to state the reclamation possibilities of a given area. Right now, they're participants in proposals just guessing."

Luscar has also set up its own demonstration plot using six different treatments of fertilizer, subsoil and gypsum. So far, the grass yields on these plots have been good, say company officials.

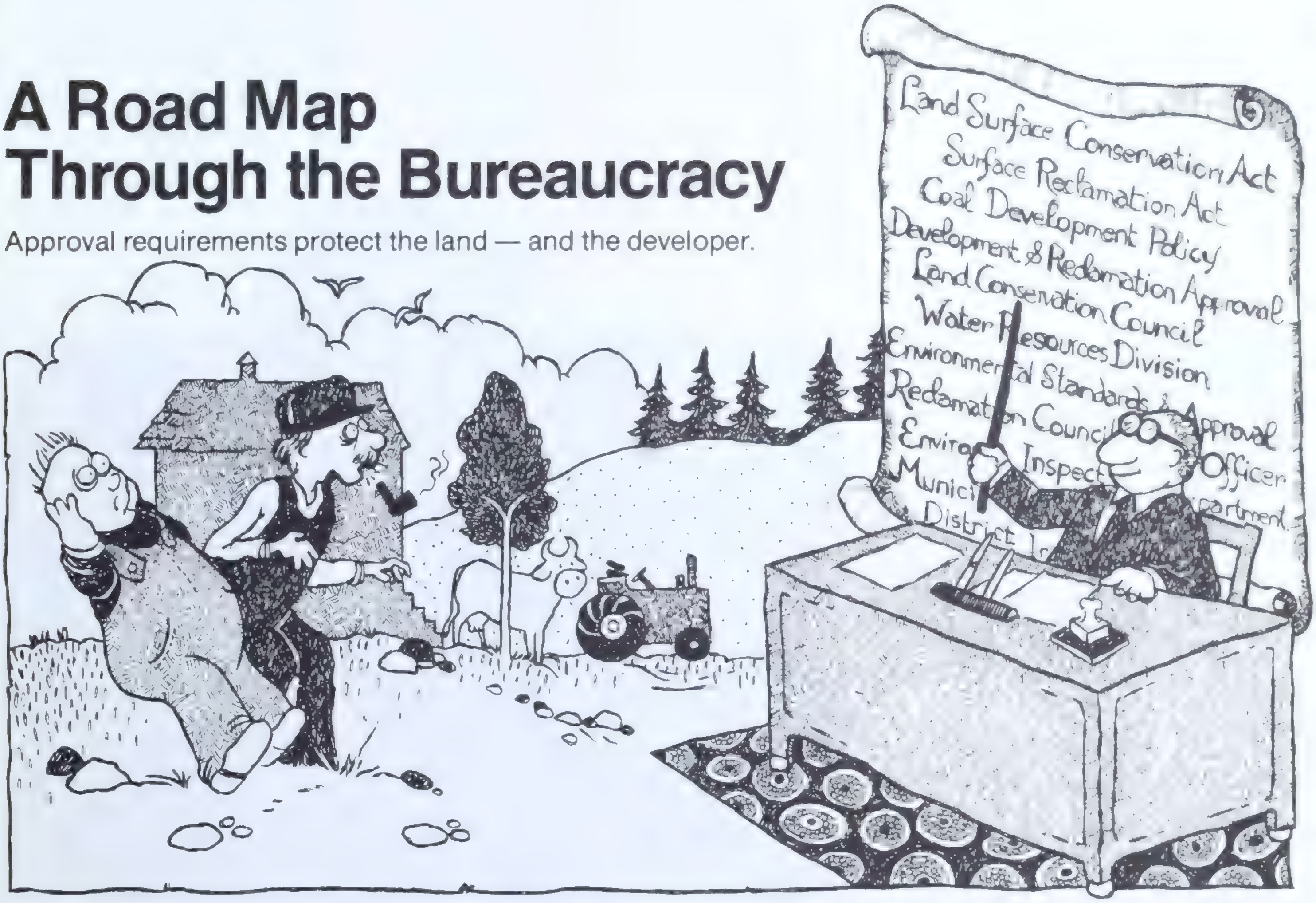
"There has been a dramatic shift in attitude in the industry," says Thiessen. "Years ago, the word 'reclamation' was really foreign. But their attitude has really changed."

Jenny Jackson is a journalist working in Edmonton.

by Gail Gravelines

A Road Map Through the Bureaucracy

Approval requirements protect the land — and the developer.



A gravel pit.

It seemed a solid business venture to two young sons of the Peace River district farmer. The area was growing, so demand for gravel would also grow. And that back section of their father's farm was known to have a wealth of gravel under the surface. There would be equipment to buy, markets to secure, a new venture to name, maybe a loan to apply for.

But local and provincial government approval would also be necessary, their father reminded them. First the municipal district authorities would have to be notified. There would be some questions about the development — perhaps the need for access roads to the pit site, or how much heavy truck traffic the site would create. Those gravel trucks not only create a lot of dust, their father said, but they can pound a road to smithereens. The brothers nodded, understanding the local concerns.

Then once the gravel pit proposal received local approval, there was the provincial government. Provincial agents would require specific details of the development site, the exact methods of development and the plans for reclaiming the pit once the gravel was depleted or the pit abandoned. Getting at the gravel means digging up the land surface, and land surface disturbances are regulated by the provincial land conservation and reclamation council. How the brothers planned to restore the abandoned gravel pit to its current state of productivity, or better, would largely determine their success in winning development approval.

Reclaim it? the brothers scoffed. That section had never even been farmed! And the gravel pit would be on *our* land — private land, so why should the province have any say? Gravel isn't even considered a mineral in Alberta. Unlike oil or coal from below the surface, where the province owns the mineral, gravel is owned by the landowner.

"The principle behind this legislation (Land Surface Conservation and Reclamation Act) is that one resource should not be developed at the expense of another resource — the land," syas D.G. Harrington, Alberta Environment's land reclamation division director. "The goal of reclamation is to bring the land back to its former level of productivity, or even better."

Since the legislation was enacted in 1973, developers proposing surface disturbance projects have periodically objected to what they consider too high a standard of land reclamation. The argument is sometimes that the land was 'useless' scrub anyway, or that the costs of reclamation will simply be passed on to the consumer in a higher-priced end product. And like the two brothers wanting to develop a gravel pit in the Peace River area, many are miffed that regulations apply to private lands.

That wasn't always the situation. From 1963 until the enactment of the current legislation a decade later, surface reclamation laws were limited to surveyed lands and were largely restricted to operations in the oil and gas mining industries. The Surface Reclamation Act of 1963 was a step forward in the province's concern for land reclamation. Previously, reclamation was a vague ideal in a development free-for-all that quickly scarred the landscape with abandoned coal mines, open pits, forgotten access roads and oil wells.

But the Land Surface Conservation and Reclamation Act added to the existing legislation. It applies to all Alberta lands, with the exception of lands used strictly for agri-

Dennis Bratton

cultural and residential purposes. It unifies the land conservation and reclamation concerns of several government agencies under one government body, the Land Conservation and Reclamation Council. And it provides a new emphasis — conservation.

While developing the specifics of the act, the Alberta government also created a Coal Development Policy in 1976, that works hand-in-glove with the land surface disturbance laws. Emphasising conservation, the coal policy states that development will proceed only when the government is assured there will be satisfactory reclamation of disturbed lands. The policy also vetoes developments in environmentally sensitive areas where any disturbance would be destructive; as in some areas of the eastern slopes of the Rockies.

Concern about regulating operations on private lands, says Alberta Environment's Dennis Bratton, fails to recognize surface disturbance operations can affect the surrounding environment. And ownership changes. Today's back section may tomorrow lie next door to a local subdivision.

Bratton, who heads the land reclamation division branch responsible for regulating coal, oil sands, transmission line, pipeline and sand and gravel operations, outlines the steps the brothers in Peace River must take to win a development and reclamation approval — the document giving development go-ahead and stating the exact requirements of the ensuing reclamation program.

First, determine if the development site is on private or public lands. Then, check with the local authorities involved (municipal district or improvement district agents) to see if they object to the development. If they do, the proposal stops here.

Once local approval had been won, the next step is the Alberta government office. Pick up an application for development and reclamation approval. Provide the legal description of the lands involved, as well as a plan or map of the areas involved.

Describe the complete process that will be going on at the pit, including crushing operations, washing operations and stockpiling if required. Applications involving a stream or washing plant require six copies of the reclamation plan and drawings. These will be circulated to the specialized government agencies involved in the protection and conservation of lands and water. For normal sand or gravel applications, only two copies are required.

The operating plan description also includes a general outline of the year-by-year activities that will take place over the life of the pit. If the time scale is unknown, the sequence of operations must be developed.

Then, a written description of the reclamation plan as well as plans and drawings are required. This should show the depth of topsoil and overburden which will be returned to the depleted pit area; a description of cultivation, vegetation and final land use proposed for the area; the time and order of reclamation activities to follow the excavation and the final grades and slopes of the disturbed areas.

Bratton says the application is forwarded to the Land Conservation and Reclamation Council; gravel pit proposals are then passed on to the land conservation coordinator specifically dealing with such developments. The proposal specifics are then circulated to government agencies concerned with the effects of development, including fish and wildlife, agriculture, environment's river engineering branch (if the project involves the bed or banks of a river), the water resources division (if the project is near a river), Environment's standards and approvals division (if the project involves returning water to a stream or watercourse). If the development is within the area of a provincial recreation site, recreation and parks is notified. If the development is considered close to a historic site, culture is advised.

As Harrington says, the reclamation law emphasizes land conservation and preservation. And knowing exactly how the land will be reclaimed *before* development approval is given is a key element in the entire process.

Once the gravel pit development and its reclamation plan have been approved, and perhaps altered somewhat to meet the demands of the land reclamation principles, a development and reclamation permit is issued. This describes the exact terms of the reclamation program. A copy is sent to the local land conservation and reclamation council field officer, who periodically checks the development site to ensure reclamation procedures are followed.

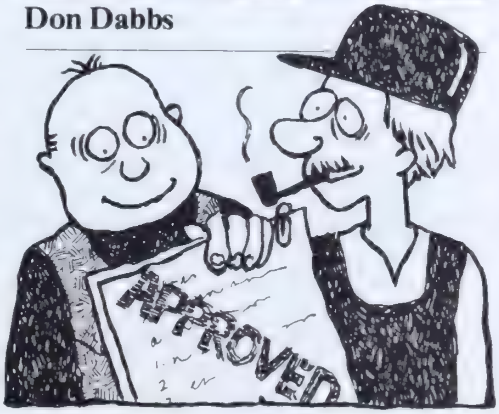
Once the pit is reclaimed to the standards described in the development and reclamation permit, a reclamation certificate is issued absolving the developer of any further reclamation responsibility.

Unlike developers of most other surface-disturbing projects, gravel pit developers are not required to forward a security deposit (intended to cover the costs of improving an unsatisfactory reclamation program) to the Alberta government.

The approval process for oil sands plants and coal mines differs slightly. Following preliminary disclosure of the development proposal to Alberta Energy and Natural Resources, most projects require the submission of an Environmental Impact Assessment (EIA) outlining the environmental, social and economic implications of a development. Once the project receives approval in principle, site — specific development and reclamation plans, processes and schedules are required. This information, like the gravel pit proposal, is circulated to affected government agencies. A system of review and recommendation is applied, with final terms of the reclamation program again set out in the development and reclamation approval. The developer must also give the Alberta government a security deposit that is returned upon satisfactory completion of the land reclamation.

Andrew Vaughan

Don Dabbs



Major transmission line proposals are also referred to Bratton's division. Once the route is established, transmission line developers must file an application for development with the Energy Resources Board (ERCB) and the information, through Environment's land reclamation division, is again circulated to relevant government agencies. As for oil wells, Bratton reports the division is involved in issuing the reclamation certificate at the project's end. Former development approval isn't required.

How have industry and developers reacted to the new reclamation requirements?

"We wouldn't be going through this intensive planning exercise without that legislation," says Don Dabbs, environmental affairs manager of Alsands. The development and reclamation plan for the multi-billion dollar oil sands operation is a 12-volume document. But Dabbs says, "It's good as far as drawing together the state of the technology."

"When the legislation first came in, companies grumbled. Now it's a fact of life. Reclamation used to be considered a separate phase. Now it's totally integrated in the mine plan," says Edmonton Power geologist Dave Mulder." But reclamation is a cost and companies pass that cost on to the consumer. Companies still make the same rate of return. Reclamation costs are reflected in the electric light bills of the future."

Mulder agrees that reclamation wasn't a pressing priority with companies prior to enactment of the law. Companies are formed to make a profit, he points out, and one sure way of succeeding is to minimize costs. Reclamation was seen as such a cost, until public outcry for environmental protection produced such laws.

Today, few developers would dare leave their sites in the chaotic condition that was once acceptable, says Mulder.

"Those days are gone."

Gail Gravelines is an Edmonton freelance writer.

by David May

Reclaiming the Oil Sands

Exactly what does it take to restore land stripped for oil production?

Alberta's oil sands may be a billion-dollar golden goose today. But are they a dead duck, in terms of future reclamation?

They're vast, and they're located in wilderness territory that hasn't seen more than a native skirmish in its entire human history. Comprising more than half the world's oil reserves, the Athabasca oil sands are an attractive proposition to an oil-hungry world.

Before this century is out, 20 full-scale oil sands extraction plants could operate in the boreal forests of this province, bringing in their wake unprecedented environmental disturbances.

Oil sands extraction technology is no longer in its infancy despite the fact that the world's first commercial plant — Great Canadian Oil Sands, north of Fort McMurray — has only been in production since late 1967.

"We have 15 years of technological history to work on now," says Dr. Bob Fessenden, head of terrestrial environment with Syncrude Canada.

Oil sands experts can now accurately forecast the effects of such mundane but politically explosive items as clay, murky water and toxic sludge, byproducts of the 60-year-old Clark hot water extraction system currently used to separate Athabasca oil from the materials that hold it in place.

Back in 1965, GCOS estimated it would need a reservoir with walls 12 metres high to hold the residual clay, sand and sludge left behind by the hot water process. The company built a suitable tailings pond at Tar Island, on the west bank of the Athabasca River, with 3.2 kilometre-long walls of compacted earth and sand stripped from the GCOS lease.

Little more than a year later, GCOS had to ask for permission to increase the height of the dyke walls. 'Due to unanticipated processing difficulties' the company needed more space for its tailings. Because of the huge amounts of water used in the extraction process, GCOS was faced with storing 1.4 cubic metres of waste material for every cublic yard it mined.

In November 1967, the walls had to be raised again. In January another 13.5-metre addition was approved, yet another in February 1970, and another in August 1973.

By the end of 1974 the original 12-metre walls were more than 60 metres high, gullies deep enough to swallow a man had appeared on the berms around the pond dyke, and an Alberta Environment Report was warning of the "major environmental implications of the failure of a dyke of this height."

In early 1975 a design review panel was commissioned by Alberta Environment to investigate the Tar Island tailings pond. In its 1977 report, it gives GCOS a modestly clean bill of health, saying that safety levels on the dyke foundation and embankment were 'acceptable,' but noting that in parts of the foundation safety reserves were 'close t the minimum we regard as acceptable.'

In the event of a dyke failure, Albert Lands and Forests recommended to the design review panel, GCOS should be hel responsible for cleanup and rehabilitatio of the Athabasca River.

No major dyke failure has occurred a the GCOS plant, now run by Suncor. Th concept of the tailings pond with its man made lake of clay tailings and sand an sludge has been adopted by Syncrude Canada, operator of the world's second — an only other — commercial oil sands plan also located in the boreal forest north c Fort McMurray.

Sycrude's 'pond' is not located by th river's edge, as is Suncor's. But it is far mor

Suncor's tailings pond — and the Athabasca River
building the dyke from overburden

vast. Estimates indicate it will contain 400 million cubic metres of thickened sludge, held by a dyke made of 1.2 billion cubic metres of compacted tailings sand, making it Canada's largest dam by sheer volume of construction material — seventeen times the size of its nearest rival, the Gardiner Dam, on the South Saskatchewan River.

Environmental problems associated with tailings ponds are many, varied and wreathed with question marks. Will the sludge in them ever settle completely, allowing the water to be removed and the dry tailings finally buried? Will the water level not rise inexorably as rain and snow lands on its unnaturally-warmed surface? Can compacted sand dykes be relied on to hold wet tailings over decades without perpetual maintenance?

And if not, who pays the maintenance bill? This is a particularly prickly question when government and industry sit down to talk environmental protection costs.

"There's no doubt that reclamation is a political question," says Dr. George Lesko, Syncrude's director of environmental affairs. Reclamation isn't even considered as a cost-effective item by his company where the northern boreal forest is concerned. Reclamation dollars, he says, "would yield a better return in the bank" and reclamation itself is "strictly a social responsibility" to be achieved at "least possible cost."

But what are the costs, and does the technology exist? In July 1977 Alberta Environment had Techman Engineering Ltd. of Calgary and Rheinbraun Consulting of Cologne, West Germany supply "a comprehensive review of the technical problems facing future oil sands developments" and asked for their suggestions on mining, tailings disposal and reclamation.

The $750,000 report took two years, involved computerized models of three theoretical oil sands plants and fills 1,500 pages. Government officials regard the report as the most comprehensive survey available.

Syncrude officials say the forthcoming Monenco study commissioned by oil industry and government will be a milestone report, refining Techman-Rheinbraun findings, especially on soil depths in reclaimed oil sands areas. Definitions of minimum chemical and biological levels needed to reconstruct boreal forest soils has been a contentious point in government-industry reclamation discussions.

Techman-Rheinbraun offered three models of reclaimed oil sands leases: minimum, improved and enhanced. These terms aren't intended as value judgements, says the massive report; they simply "reflect advances in tailings disposal and mine operating techniques . . . which will lead to a progressive improvement in reclamation potential of any given mining site."

In other words, we may not have the technology yet, but we could have it in the future.

In a minimum-level reclamation plan, tailings ponds would be limited only in their size. An improved-level plan would add what kind of treatment of pond sludge. The enhanced level would have no ponds at all; tailings would be completely de-watered (expensive, but feasible), then buried in mining pits.

While Syncrude officials admit there's no question that tailings ponds can be left untreated indefinitely, they are also quick to point out the dollar costs involved in treatment.

The difference between Techman-Rheinbraun's minimum and improved levels would cost Syncrude $1 billion based on current production, says Lesko.

"It's a horrible amount of money . . .

especially when matched against the potential productivity of the reclaimed land." Syncrude contends maximum forest yield on their lease would not exceed 14,000 cubic metres of commercial timber, an amount not worth harvesting in a muskeg area.

Maybe, says Dr. Paul Ziemkiewicz, reclamation research coordinator with Alberta Energy and Natural Resources. But it's not a question of the dollar value of reclaimed oil sands land that concerns him.

"It could be zero-dollar value land," he says. "But it could also prove a multi-million dollar public liability."

Government forestry officials add that the forest was at a low point in its natural 80-year cycle when Syncrude made its calculations. Several forest fires have swept the region during the past three decades.

"The standing crop may not be so good," admits Jeff Bondy, Alberta Forest Service resource specialist. "But all over Canada we're losing our prime timber lands. These marginal lands are becoming more important all the time."

The problem is that even the best-educated experts are unsure what it takes to reclaim soil stripped away by oil sands processes, or indeed how much has to be put back to ensure revegetation.

Boreal forest muskeg has to be stripped in winter for ease of handling, then piled while frozen. What happens deep inside the piles over time? Will vital soil nutrients decrease, or remain suspended? The answer to that one question alone could mean hundreds of millions of dollars to Syncrude, Alsands and other oil sands companies planning their extraction proposals.

Dr. Sam Takyi has no doubts on this matter. Cheaper reclamation techniques may mean cheaper gas, says the Alberta Forest Service's reclamation expert. But in future we could drive through a desert created because of our environmental economics in the 1980s.

"How did the Sahara become what it is?" he asks. "Through people stripping away forest cover for fuel."

David May is an Edmonton freelance writer.

by Jack Spearman

Linear Sites

Only 20 metres wide, but thousands of kilometres long

The need to heal the scar left on the earth by something like an open-pit mine is obvious.

An oil or gas pipeline seems like small potatoes by comparison, especially in view of the wealth it generates. Even landowners directly affected by construction can take solace not only in financial compensation for land taken out of production, but in fact the disturbance is temporary and the problem disappears once the construction crews pass his border fence.

In fact, surface disturbances lacking a single location — oil and gas wells, pipeline and roadway construction — constitute a surprisingly large share of reclamation work in Alberta. About 24,000 kilometres of primary and secondary highways cross the province. And would a strip mine be able to stretch two metres deep and 168,000 kilometres long as Alberta pipelines do?

Reclamation policies in the oil and gas industry have steadily been upgraded since the early 60s, says Stan Tracy, secretary of the Land Conservation and Reclamation Council of Alberta Environment.

"In those days there were a lot of complaints about well sites that were being abandonned and left in something of a mess. Sumps were being left open, roads were not reclaimed, fences weren't being repaired, that sort of thing."

The council was enacted in 1963, years before the environment department itself came into being. The emphasis back then, says Tracy, was contouring land back to its original shape and ensuring no mess was left behind.

Now, reclamation procedures aim to restore disturbed land to its original fertility. When possible, topsoil is stripped away, saved, then put back. Reseeding is also standard now.

Andy Teal, environmental adviser to Esso's regulatory compliance section in Calgary, says reclamation work in the industry may involve hauling in fertilizers and the planting of specially-selected grasses and saplings.

"In extreme cases, it can even mean bringing in topsoil . . . it's a procedure that can be very expensive."

Some reclamation projects, he notes, involve buying fresh manure — at about $10 a metre — and the price per hectare of reclamation work often hits well over $2500.

"In some areas, reclamation is a continual process that's carried out until the situation returns to normal. We will go back and check every year."

Teal says the industry takes the question of reclamation more seriously now. He points to a four-inch-thick manual on reclamation procedures recently released by the Canadian Petroleum Association that took several years to compile and write.

Tracy says his branch lays down no hard-and-fast rules for reclamation in the oil and gas industry. "The situation can vary so much. Some areas will have a foot (.3 metre) of topsoil, others only two or three inches (five to eight centimetres). We may refuse to let a pipeline through a mountainous region because reclamation will be virtually impossible. We consider the soils, the geography, the people in the area . . . we get input from the highways department, the people at fish and wildlife, the culture department about archeological sites."

Construction of a pipeline over 16 kilometres long and 15 cm in diameter must be approved by the Energy Resources Conservation Board (ERCB) which funnels applications through the land reclamation council. If approved, the pipeline builder must post a $10,000 security deposit with the council.

The council's 20 field inspectors check that reclamation requirements are followed. If not, the council can issue orders for work to be done and in extreme cases, use the deposit to make sure guidelines are met.

Tracy describes co-operation from the

industry as 'fairly good.' "I think the cooperation is going to get better as the industry becomes more aware of what we're asking them to do."

Ed Caldwell, of Esso's regulatory compliance section, agrees. "Clearly," he said during an earlier interview, "it is in our own best interest to reclaim land as quickly as possible, both from the point of view of cost but also of aesthetics."

Reclamation work will increase over the next decade or so as existing conventional fields go dry and are abandonned.

"Regardless of special recovery techniques, many of those wells are simply going to be abandonned. That will mean increased activity in reclamation and reseeding."

Reclamation work is also likely to increase at well sites as fields deplete and salt water is sucked to the surface along with the oil.

Caldwell notes that the Redwater field, which seven years ago pumped about 50,000 barrels a day of salt water to the surface, now brings up about a million barrels a day. And as the sheer volume of the highly corrosive, sometimes sour salt water increases, so does the chance of a spill.

That presents a special clean-up problem. Teal says that to reclaim land after a salt spill, gypsum and lime compounds are applied to the soil to speed the natural leeching of the salt down past root zones. Later, regular reclamation work is undertaken.

Drilling mud, which sometimes also contains salt, can also spill. But Teal says its thickness makes clean-up and reclamation easier, and a minor problem.

The oil and gas industry is large and complex, studded with hundreds of specialized companies and sub-contractors. One company may apply to build a pipeline through the ERCB, but sometimes another company will later be given the contract to reclaim land along a pipeline.

Are the extra links in communication between head office and the field a barrier to reclamation?

Ron Findlay, manager of environmental affairs at AMOCO, disagrees, saying that AMOCO does its own reclamation work.

Andrew Vaughan

Ron Findlay

Tracy sees the question somewhat differently.

"There have been times when the orders given out by this office do not make it through the channels of communication out to the men in the field. There is sometimes a problem of communication between the first guy and the second or third guy."

He notes the $10,000 deposit is an incentive for fulfilling reclamation guidelines. "But every now and then, somebody will come back here . . . what can we say except, we told you so?"

Oil and gas wells are often well off the beaten path. Pipelines are buried and it is possible to return the land to pre-disturbance levels of productivity. The same cannot be said, however, of something like a four-lane highway through the mountains.

Al Werner, transportation planning services manager with Alberta Transportation, says reclamation work alongside roads has two major functions: to control erosion, and to make the road blend into the landscape as much as possible.

"As recently as 15 years ago, the only purposes of reclamation was to control erosion," he says. "But now the concept has expanded to try and make the roadway a part of the environment . . . it's something that has developed alongside the growth of landscape architecture."

The reasoning behind erosion control is plain enough. The aesthetic side of highway construction has evolved with increased awareness of the environment, he adds.

"Aesthetics are just more important now . . . and in some cases there is a price to be paid for it. Other times there need not be, because good planning at the beginning can make those costs minimal. If we try to give a road some cosmetic treatment after the fact, it can get very expensive."

Erosion is a natural process and roadbuilders are careful to ensure the stability of roadbeds. "Yet the stabilization of soils disrupted by grading and ground cover removal is often overlooked," states a transportation department report giving landscape design parameters which Werner helped compile.

"In such instances, induced erosion may threaten to undermine the roadbed, prevent natural vegetation of slopes and increase instability of adjacent water bodies."

Erosion control frequently involves contouring land and reseeding it with compatible vegetation; returning the land to its normal state of fertility, although the surface has a different appearance.

Most often, a mix of ground cover seeds are used. As the report notes, a single species of grass might be susceptible to a disease which could wipe out a reclamation project. That in turn could leave a patch of ground almost bare, susceptible to erosion and unattractive for another species of grass to take root in. Erosion-control grass mixes must sprout quickly and grow rapidly, and be able to withstand extremes of climate.

Highway crews take care during construction to strip and save topsoil for reclamation work later.

"The most common errors in attempting to establish erosion control techniques are not using enough mulch, topsoil, seed or fertilizer," states the report. "Good plant growth cannot occur until a productive soil has been re-established . . . it is recommended that applied topsoil and subsoil be blended to provide a suitable medium for pioneer plants."

Other methods of erosion control involve routing of the right-of-way, or methods of construction. For example, on sandy soils alignment should stay as much as possible on level sections to avoid earth moving on slopes. Grades below 15% are recommended, and if slopes are disturbed the edges should be rounded and immediately reseeded after construction. In the mountains, retaining walls of rock held in place by wire mesh are sometimes used while in other cases, the report notes, simply building an elevated roadway may be the best answer across unstable slopes.

Wildlife may also affect construction when roads are built across migration paths. To overcome this, roads may be fenced off except for a section of flat, open road which allows animals and motorists to see each other. In the case of domestic animals, underpasses for cattle and horses have been built beneath Highway 2 near Red Deer for example, where the highway traversed farms and pastures.

Building roads through wetlands involve special problems. "Wetland areas are highly sensitive to changes in the hydrological regime," says the report. "Small changes in the water level can cause large changes in vegetation on either side of the road, which in turn affects wildlife . . . culverts and ditches can reduce such impacts."

One of the ideas behind highway design is that if they fit into the landscape, less reclamation work in the broad sense of the word will be needed. It's a diverse concept, suggesting that when a road runs along the face of a cliff, it should be built at the talus line, the point where rock falls have piled up.

In rural areas, meanwhile, the report suggests farmers not be discouraged from haying in ditches, because it brings the environment closer to the motorist.

Jack Spearman is a Calgary journalist.

by Muriel Stringer

Nature Reclaims Its Own — Sometimes

Natural reclamation may be slow and painful — or may burgeon into regrowth.

Dr Paul Ziemkiewicz RRTAC

Is nature best left alone to heal scars on the landscape? It may be a comforting thought, but the reality of waiting for natural revegetation to disguise scenic eyesores may be a good deal less acceptable. Recovery of disturbed areas is almost always slow, and in some cases may never take place at all.

"It depends essentially on four main factors," explains Dr. George La Roi, a professor in botany at the University of Alberta. "There's the kind of substrate you're dealing with for a start. The material on spoil heaps left after a mining operation is often very poor in nutrients. As well, it tends to have little capability to hold nutrients so that even if you tried to give nature a hand by adding fertilizer, it would be gone after the first couple of rains."

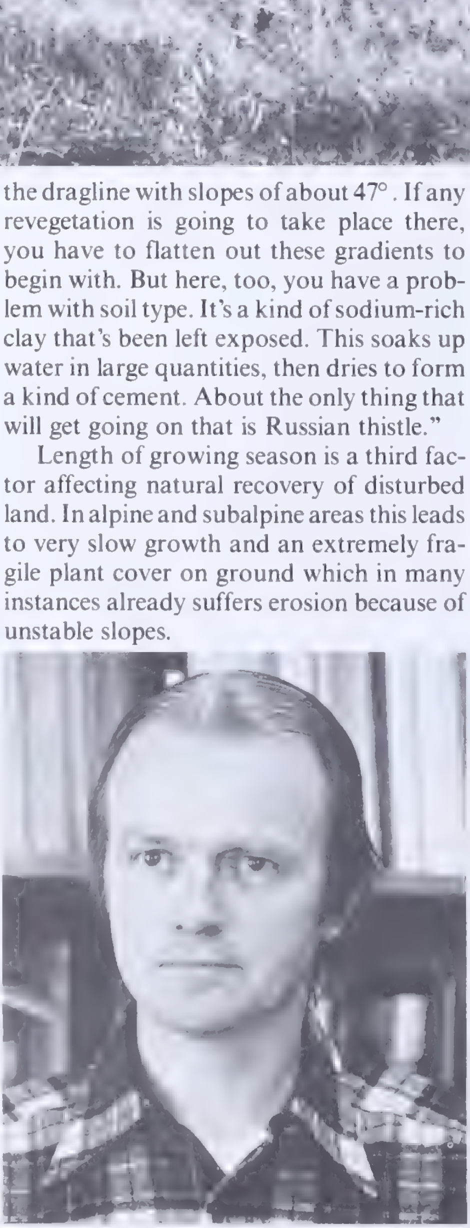
Stability is also important, since most sloped spoil heaps allow rapid water flow, and discourage plants from establishing themselves.

"Mine dumps aren't the only problem slopes, though," points out La Roi. "Some parts of the province are naturally steeply sloped and very unlikely to become recolonized by native species invading the area after a disturbance. Alpine and sub-alpine areas are especially difficult in this respect."

Dr. Paul Ziemkiewicz, Chairman of the Reclamation Research Technical and Advisory Committee, adds that spoil heaps usually have slopes of about 40°, which is about twice as steep a gradient as could be expected to support natural revegetation.

"In the case of many of the plains coal-mining operations, you'll find ridges left by the dragline with slopes of about 47°. If any revegetation is going to take place there, you have to flatten out these gradients to begin with. But here, too, you have a problem with soil type. It's a kind of sodium-rich clay that's been left exposed. This soaks up water in large quantities, then dries to form a kind of cement. About the only thing that will get going on that is Russian thistle."

Length of growing season is a third factor affecting natural recovery of disturbed land. In alpine and subalpine areas this leads to very slow growth and an extremely fragile plant cover on ground which in many instances already suffers erosion because of unstable slopes.



Andrew Vaughan

Dr. George La Roi

"Continuing human impact is a factor we often tend to forget," concludes La Roi. "Some mined areas have become popular for recreation and this is adding to the difficulties of re-colonisation. Around Mountain Park, for example, snowmobiles and trail-bikes are destroying the growth of native plants which are making a slow comeback on mined land. Some of these parts have so little plant cover that, even without this destruction, it would take a couple of hundred years before you could say the ground had returned to anything like a normal vegetation cover."

Distance of disturbed ground from a source of native species is also important, says Ziemkiewicz.

"If the bare ground is more than twenty feet from the nearest native vegetation, it's unlikely you'll see anything happening in the way of natural recovery. A small disturbance such as a seismic line right in the middle of the bush will come back to its natural state quite quickly.

"But remember it's a combination of factors that determines how well an area will recover, if, in fact, it recovers at all. A seismic line running across a mountainside would have a lot more difficulty because of instability of the slope."

Soil compaction in some cases may be a consideration, suggests Matt Fairbarns, a resource biologist with Alberta Recreation and Parks. Historic trails, some over a hundred years old, may be so severely trodden that the hard substrate is still showing little sign of revegetation.

"Sometimes, areas people might expect

loose phone wire on one reclamation site meant an elk's terrified solitary death

Dr. David Walker University of Alberta

to revegetate easily don't turn out that way," he warns. "It isn't necessarily true that slumped banks and roadsides develop a natural plant cover quickly. There, you may get a fairly rapid growth of 'ruderals' — that's plants that like waste land and rubble — but there are also cases where this hasn't taken place at all. In the Swan Hills area, there's very bad soil erosion along roads and cut-lines. The soil has a lot of clay and an extremely poor rate of natural revegetation."

Alberta's most successful natural revegetation, he reckons, tends to be in forested regions, especially those with aspen-spruce forest.

"North of Lesser Slave Lake, the land's just riddled with oil drilling disturbances, but revegetation is generally very good. In many ways, it's like recovery after a fire, although if there's been heavy equipment used at the site, soil compaction is an additional problem. But if the damage hasn't been too severe, you might expect to see a pretty full recovery in about eight years."

Other regions have greater difficulty. Arid and nutrient-poor parts of the province are especially slow to revegetate. Some of the mined land in the badlands west of Drumheller is showing a very slow recovery, largely because of the extreme shortage of water and nutrients as well as the steeply sloping terrain.

Dr. Paul Ziemkiewicz RRTAC

"Sandy soils present one of the worst problems," Matt Fairbarns explains. "For example, there's the Fort Assiniboine dune area near Whitecourt. It's had cut-lines put through it and a lot of oil and gas exploratory drilling. The soils are dry and unstable anyway and the sloping nature of the dunes makes revegetation even more difficult. The cut-lines didn't go across the steepest slopes but people seem to like to park high up so that they have a good view while they're eating and drinking. Damage has taken place over about the past 10 to 12 years and natural recovery is slow and pretty precarious."

Abandoned farmland is not, however, a major concern in revegetation. Very little land in Alberta fits this description.

"Except for some homesteads in the Peace River area, I can't really think of any farmland you could call abandoned. This is much more common in the eastern part of North America — you get so-called 'old field' succession quite extensively there, but not in Alberta."

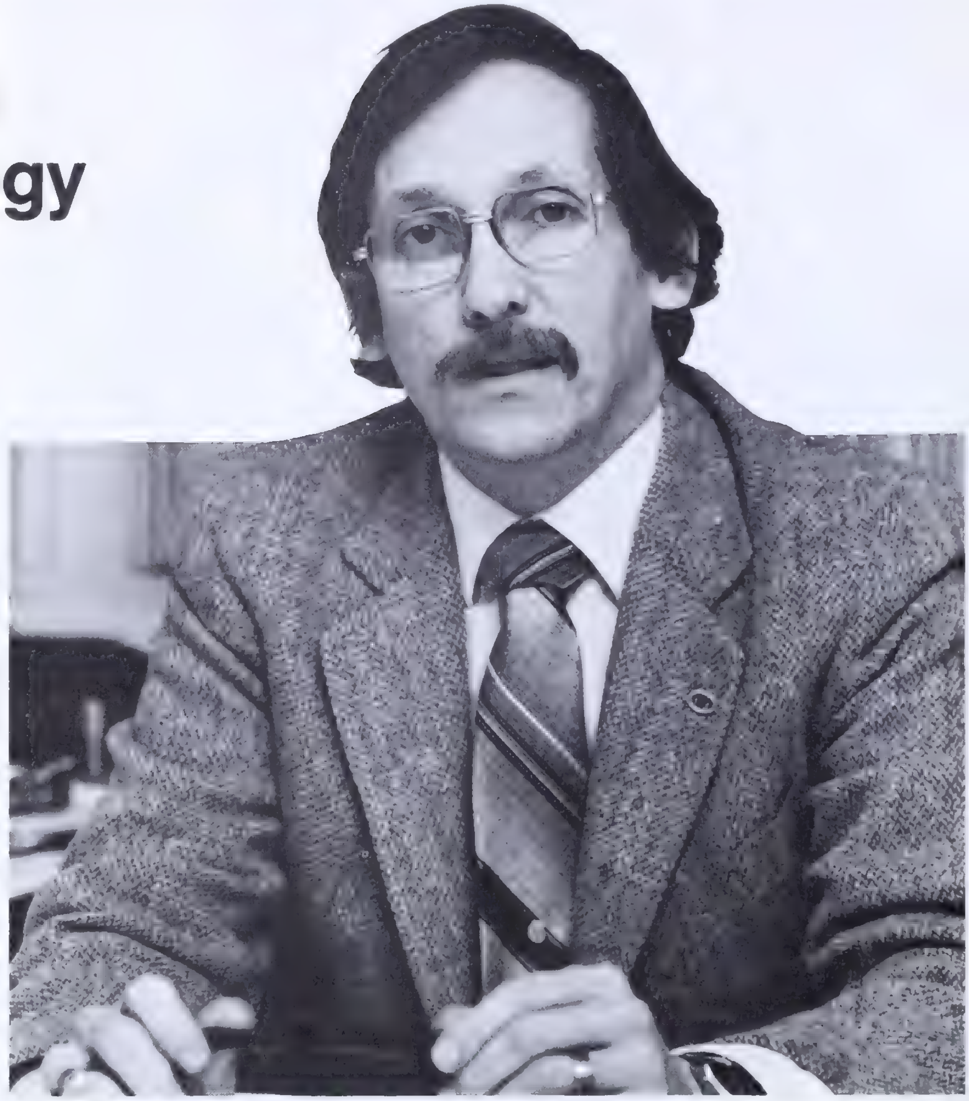
In general, it seems unrealistic to expect natural revegetation to play a major part in many disturbed areas of the province. It is at best a long-term prospect in most cases, and readily subject to setbacks. "You can't just flatten out a spoil heap and expect nature to do the rest for you," Ziemkiewicz puts it bluntly. "And when it comes to alpine areas, it's almost impossible in sites above 6,000 feet (1800 metres)."

Muriel Stringer is a freelance writer living in Edmonton.

by Gail Gravelines

Researching a New Technology

Coordinated research produces down-to-earth results.



Dr. Steve Moran

Lauren Dale

In Alberta, reclamation research isn't conducted on a hypothetical plane. It's problem oriented.

When industry, government and university representatives involved in Alberta land reclamation research projects meet, it's to discuss progress in solving reclamation problems of specific development regions.

"The research we do focusses mostly on the problems of a particular property and the peculiarities of reclamation of that site," says Ken Crane, senior planning co-ordinator of Luscar Ltd.

As one of three coal mining companies involved in the Battle River Research Project, Luscar has added its financial and manpower resources to solving some of the reclamation problems unique to the plains coal mining region of Alberta.

The challenge? To restore mined lands to a productivity level equal to, or better than, its pre-disturbance state.

Surface mining on farmland raises questions about future soil productivity. Can the topsoil be removed, stored and replaced while maintaining its original level of productivity? How can the soil be reconstructed to support adequate plant growth? Groundwater is another concern. What will happen to the water supply after large-scale surface mining? Will water tables re-establish? Will they be as productive as before mining? And will saline ground water eventually carry growth inhibiting salts to the reclaimed surface?

The answers to many of these plains region reclamation questions come from current research in the Battle River coal field, south of Forestburg in east-central Alberta. This cooperative industry-government program is exploring methods of rebuilding thin, sodic (salty) soils over some of the mine areas. Tests are also underway to determine how much topsoil and subsoil are needed in reclamation areas to produce acceptable grain and forage crops. And the effects of surface mining on groundwater are also under examination.

"I wouldn't say our research is theoretical, it's more long-term, concerning itself with the second-order effects of our current technology," says Dr. Steve Moran of the Alberta Research Council's plains hydrology and reclamation study. "We sometimes spend thousands of dollars per acre in land reclamation, and this study is to identify if those efforts are working. Sometimes, the solutions we employ today cause problems worse than the original ones 25 years down the road."

The Alberta Research Council project is aimed at identifying some of the changes in quality, quantity and distribution of groundwater after mining, with the eventual goal of predicting the 'reclaimability' of a site prior to mining.

As with most reclamation research projects, results are not immediate.

The Battle River Research Project began in 1979. Recognizing many of the reclamation problems confronting the individual companies operating in the area were particular to the plains region itself, the Alberta government, through the Reclamation Research Technical Advisory Committee (RRTAC), entered into the industry research program. The government reclamation research program, drawing on funds from Alberta's Heritage Savings Trust Fund, was established to provide answers to the many practical problems of land reclamation.

Although site-specific reclamation research is considered the responsibility of the industry or individual developing the site, the Alberta government may also apply its resources when the research addresses reclamation problems of a bio-physical region.

But anyone looking for a set funding formula for reclamation research in either the public or private sector will soon find it's non-existent.

"Projecting the costs of research and the division of those costs within the industry itself is a problem we're currently wrestling with," says Suncor environmental affairs manager William Cary. As land reclamation chairman of the industry formed Oil Sands Environmental Study Group, Cary is acutely aware that reclamation research is unpredictable. A breakthrough in the technologies required to return the large tailings ponds and mined-out oil sands pits to former productivity levels could occur in one or ten

Lauren Dale

years. His company now spends $1 million annually in reclamation research, but Cary admits that may not be enough — when answers to oil sands reclamation problems are discovered — for implementation or further research. The uncertainty makes research budgeting awkward.

As at Battle River, RRTAC has pooled its resources with those of the industry-formed Oil Sands Environmental Study Group to discover solutions to oil sands reclamation problems. One project aims to identify the available soil-building materials in the area, and develop methods of combining those materials into productive soils. Other research projects are examining native and exotic tree and shrub species to select varieties suitable for oil sands reclamation, and examining the results of previous plantings on oil sands. Again, getting results from such research takes years.

Who takes the lead in reclamation research? Cary says the practice is a "typical Canadian compromise." The government isn't satisfied with what the industry does, monitors us and does some of its own, he quips. But since the 1973 enactment of the Land Surface Conservation and Reclamation Act, Cary claims the research efforts of industry and government are more co-ordinated, avoiding the 'shot-gun approach' that marked earlier research activities.

Although Alberta's oil sands area developments are forerunners of such projects on a world basis, Cary says the materials-handling problems encountered in the brown coal developments in West Germany are similar to the problems faced here. Researchers are exploring some overseas methods to see if they are applicable to the local situation.

The reclamation problems of Alberta are representative of three bio-physical regions that host specific kinds of development. There's the plains area with coal mining and electrical generating developments. The oil sands area poses the challenge of reclaiming tailings ponds and mined-out pits that consist of nearly pure sand. The demand there is to identify and develop soil amendments that will support plant growth, discover which native plants will best take in the reconstituted area and develop the equipment necessary to carry out reclamation. And Alberta's mountain and foothill area, attracting both recreational and resource developments, demand the development of native grasses and woody species that will grow in high elevations, as well as the problem of soil reconstruction, grass establishment and erosion prevention through re-vegetation.

The three regions pose different reclamation problems. Alberta researchers often draw on the experience of reclamation activities in North Dakota, Wyoming and Montana in dealing with the problems of plains coal mining. Moran says the developed lands are similar to Alberta's plains area, but adds solutions are not instantly transferable. Soil or groundwater differences — vital factors in reclamation — can differ from site to site.

Canadian research applicable to Alberta problems? Moran says he isn't aware of any. Problems in the alpine regions, for instance, would only be shared with developments in British Columbia — and researchers there look with envy at Alberta's reclamation research programs.

Jack Thirgood of the forestry faculty at the University of British Columbia reports the onus for research in that province is on the private sector, with minimal government involvement.

Moran says the initiation of Alberta research activities comes from every sector — universities, industry and government —with the government-appointed Reclamation Research Technical Advisory Committee acting as the referral and coordinating body for reclamation research.

One example of that co-ordinated effort is found in a project examining the development of native grasses suitable for development in alpine and sub-alpine land reclamation sites. Parks Canada, the University of Alberta, and the provincial forest service have combined manpower and fiscal resources to attack the problem.

But as one industry spokesman says, reclamation research isn't an attention-seeking activity or a hypothetical process. Alberta researchers attempt to find solutions to immediate and future reclamation problems.

Gail Gravelines is an Edmonton freelance writer.

by Sharon Adams

Changing Attitudes to Land Reclamation

'Earth is not given by our parents, but borrowed from our children.'

Lauren Dale

When did land reclamation become a public issue? If it can be pinpointed, perhaps it was during the Dodds-Roundhill debate in the mid-70s.

Though the project's proponent, Calgary Power, had a good record for land reclamation, Dodds-Roundhill area residents and naturalist, agricultural and public interest groups persuaded the provincial cabinet to quash the project on grounds that there was no guarantee the site could be successfully reclaimed.

John Railton, manager of environmental planning for Calgary Power, says reclamation was only the excuse for denying development — that political factors may have been the motivating force.

But he also says the company was a victim of time. It proposed a controversial project just when the public was becoming environmentally literate and demanding, and the government was responding by tightening standards.

Henry Thiessen, assistant deputy minister of Alberta Environment, says industry's attitudes have changed favorably in tune with changes in reclamation legislation.

"Industry was initially reluctant to be involved in reclamation, partly because of the cost," he says. "But when the legislation was passed and it was a requirement, they complied. Today most major companies are pretty responsible."

Prior to the Land Surface Conservation and Reclamation Act of 1973, the requirement was that upon abandonment of an industrial site, the land had to be 'satisfactorily reclaimed.'

Thiessen says in those days reclamation was almost an afterthought. At some well sites, companies would simply flatten the terrain, not bothering to reseed it. Decades later, a few sites are still denuded.

Since the new legislation was passed, industry is required to "reclaim to a standard equal to or better than what they found."

Companies are researching best methods for reclamation, which is increasing in cost.

John Railton

Dr. Percy Sims, research manager of terrestrial systems with Alberta Environment research and management division, says bioengineering will ensure the best results, but with higher costs.

This technology blends conventional engineering materials and living plants to provide strength and durability. Not generally in use in Alberta yet, its usefulness lies in difficult-to-reclaim sites, where conventional materials just won't do the job.

Deciding what methods to use and what standard to bring the land back to is difficult, says Dennis Lang, chairman of Alberta's development and reclamation committee. The committee, made up of experts from 10 provincial departments, reviews industry plans for reclamation to ensure the best end-use options.

"Each operation has its own particular problems," Lang says. Sometimes it's possible to restore the land to its original condition. More often this is not possible, so developers must put the land "back to effective use — not necessarily what you had before."

"Much of our reclamation legislation developed out of past practices when the lands were left derelict. The public became generally more aware land is a limited resource; that you shouldn't sacrifice one resource for another. Mining is a temporary use, but agriculture and recreation are long-term."

Although the Dodds-Roundhill project was stopped, a similar mining and power project near Genessee is nearing approval.

Lauren Dale

Though final approvals are some time off yet, public interest groups, the province, Edmonton Power and Fording Coal are working together to decide what kind of reclamation is necessary.

"There's a fair amount of pressure on that land for country residences, and its principally agricultural now," says Lang. "We'd like the reclamation to leave as many options open as possible," including residential, agricultural and recreational use.

Edmonton Power's Ken Warren, whose duties will ultimately include reclamation, says construction on the plant will begin in 1982, and the earliest mine development will likely be in 1985.

"Our intention is to return as much of the land as we can," he says, adding the standard of reclamation will depend on ultimate use, a joint decision to be made before final permits are requested.

Dodds-Roundhill was a different situation, says Ivan Weleschuk, Unifarm's director of member services and secretary to the organization's land use committee. Calgary Power's attitude did little to allay farmers' fears that the land would not be reclaimed.

"Some farmers felt Calgary Power hadn't done any background work. They didn't say what reclamation would cost, how long it would take. The company was entering into an area it had little knowledge of and there was a reluctance to spend too much money on reclamation."

Quashing of the project reverberated throughout industry. Faced with tighter regulations and an increasingly militant and aggressive public which could cause extremely costly delays in getting projects on stream, industry began hiring environmentalists. These people were hired to anticipate objections to projects and come up with alternatives that would satisfy the critics and smoothe the way through the approval procedure. Yet their very presence on staff has helped mellow companies' attitudes towards environmental issues. Industries now see their environmental concern as evidence they are 'good corporate citizens.'

John Railton, Calgary Power's manager of environmental planning, was hired in the mid-70s. Now industry appreciates the necessity for early research, he says. Calgary Power's $2.4 million reclamation research project is good business, and its cost is insignificant compared to costs incurred by approvals processes prolonged by answering questions from concerned citizens.

Ron Findlay, manager of AMOCO's environmental affairs department, also notes gradual change in industry attitudes.

"What happened in the past was sites were left for a year or two and erosion problems began and we had to go back and fix them."

Soon industry discovered it was more expensive to go back and fix problems than to prevent them. Engineers now designing AMOCO projects also consider needs for eventual restoration , and incorporate these needs in development plans. "Public awareness and public pressure to do a good job" are positive influences to reclamation.

Railton says that while "industries are becoming more responsible, they have an economic imperative — the consumer ends up with the cost and when industry spends dollars, they consider the best returns both to the shareholder and the consumer."

Costs of reclamation are generally absorbed by the consumer, either through eventual cost increases in products or through increases in the costs of regulated commodities like oil and gas and electricity.

But some companies have to absorb the costs of reclamation. An export coal company could hurt its competitive ability by increasing the price of its product internationally to cover the cost of domestic reclamation.

Calgary Power is trying to determine what reclamation technqiues and standards will strike the best compromise between cost and land usability, says Railton.

"On land that costs $300 to $400 an acre, reclamation could be $6,000 per acre, and the regulators may want to spend $28,000." Research can narrow the gap.

"Industry is in business to make money and the regulations are open to interpretation," says Dennis Lang. "We don't have faith that if the regulations were dropped we'd get the kind of reclamation we want."

Government vigilence is as important to the process as industry initiative.

Bonds for reclamation insurance reflect this, he says. For instance, the bond for a prairie mine is 25 cents per tonne of coal produced. In the foothills that rises to 50 cents and in the mountains can reach $2 per tonne.

AMOCO's Findlay says reclamation is just "a part of the price of doing business." He estimates the company can spend between $3700 and $5000 per hectare on reclamation work. Each year the company drills about 200 wells and carves out several hundred miles of seismic line.

Ken Warren says Edmonton Power expects to spend $6,000 per acre in 1980 dollars each year over the 30-year life of the project, reclaiming the affected 10,000 hectares.

Lauren Dale

As AMOCO's Findlay says, "the last thing the petroleum industry wants is public criticism."

Public interest groups are still concerned and sceptical about industry's tunnel-vision and the province as steward of the environment.

Most groups contacted had praise for individual industries, and harsh criticism for the government. Many were upset by past omission and others were concerned about the future.

Mary Helen Posey, of the Federation of Alberta Naturalists, was explicit in her criticism: industry does shoddy research, government has confusing regulations and too much is left to chance in ensuring regulations are met.

"It's much more expensive enforcing regulations than passing them," she says. "Some method of seing to enforcement has to be built in, or even the best regulations won't work."

Because so many contractors and subcontractors are involved in each project, sometimes violations occur even without the sponsoring industry's awareness.

Also, "there's too much legislation," and it's not rationalized.

"Land use management has got to be done in a co-ordinated fashion," she says. Now, the Energy Resources Conservation Board, Surface Rights Board and reclamation and development committee can work at cross-purposes. She also advises companies to take a broader look at habitat.

"It's fine for them to say they will reseed, but when we ask them where they will find the seedstock, they often don't know — and certainly the ERCB won't ask where the supply of seed will come from or what fertilizer is needed."

Sometimes companies address the impact on large wildlife such as deer or elk, but will ignore the impact on insects which feed small predators which eventually end up as food for other game. Without one, the other cannot survive.

Citing laxity of pollution control and lack of interest in the acid rain question, Tony Ferguson, past president of the Fish and Game Association, says the province "tends to be like Rip Van Winkle — asleep for 40 years."

John Lilley, chairman of the Alberta chapter of the Society of Environmental Biologists, worries about the incremental effect of disturbance by industry which reclamation may be unable to overcome. The biologists, working on their own time on a limited budget, can't study the hundreds of small developments.

"There should be more research into the long-term results of reclamation," he says.

Brian Staszenski, president of the Alberta Wilderness Association, says this group aims to stop development that would eliminate wilderness areas.

"Once you've disturbed a wilderness area, you've lost it. It becomes man-made."

"It's not a matter of stopping development," he says, "It's a question of proper and sane development. Companies still don't know what they're doing. They're in an experimental stage, saying they can reclaim an area, without really knowing whether they can."

"We're concerned that agricultural land is being taken up and converted to non-agricultural purposes," says Ed Motowilo, regional co-ordinator for the National Farmers' Union. "The corridor between Edmonton and Calgary has the best land in the province, and it's slowly being taken up." Genessee is in this area.

"We have a saying at NFU that we must not treat the earth as something given by our parents, but as something borrowed from our children. We're worried Canada won't be able to produce as much food in the future."

Steve Lorincz, chairman of the Genessee and Area Concerned Citizens' Group says reclamation offers a community an unique opportunity for long-term planning.

But it also puts a responsibility on the community to make up its mind quickly about land use years ahead.

"Before the land is ever disturbed, they should know what quality it should be returned to," he says. "For instance, the cooling pond is going to be major — 1,500 acres (600 hectares) — and if it's going to be part of recreation development, they have to know now because the initial construction will be different."

Sharon Adams is a journalist working in Calgary.

Letters

The Editor:

I would like to commend your excellent publication. I enjoy every issue and believe that this communication process is badly needed to provide a better understanding of the growth repercussions in our province. I have been very disturbed by the inability of so many Albertans to take a broad public interest point of view rather than a narrow special interest position. Your publication could provide a very real service by dealing with the "trade-off" logic of the social and environmental impacts of industrial developments. Each new industrial plant creates an incredible demand for new support infrastructure. May I suggest a couple of areas where a broader public acceptane of our reality is needed in the hope that future issues of your Environment Views would discuss them.

The very real uncertainty in such communities as the Hamlet of Keephills suffering from the relocation question because it is situated over mineable coal; the uncertainty of a farmer faced with a possible strip mine operation for coal situated under his land; the uncertainty of an owner of land in a valley that could become a water reservoir for a hydro power development, or city property owners whose residences may be needed for large developments of any kind, all suffer the common ailment of tenure uncertainty. City property owners suffer loss of environmental quality resulting from pollution, traffic and construction annoyances in addition to buildings cuasing view blockage far more severe than most rural growth impairments. This type of problem presents a real socio-economic problem that is common to all land owners.

Land owners be they urban or rural must accept the face that mineral or any form of development for the public good is an *inherent risk of land ownership*. This viewpoint must be promoted for better understanding and acceptance. Adequate compensation if and when development takes place is the real issue — not the individuals private right to obstruct development which can be established as being in the public interest.

Another attitude needs clarification and enlightened acceptance. Maintaining public confidence in such government appointed boards as the E.R.C.B. and the S.R.B. presents a very real challenge. These boards must appear to be impartial and must be perceived to be acting in the public interest. The willingness of the public to accept the decisions of such boards depends so much upon a proper understanding of their roll and the process of decision making.

It should be recognized that the hearing process is designed to ensure that persons who are adversely affected by decisions in the public interest will have a fair and reasonable opportunity to provide evidence and argument *before* the decision is made. It is also important to recognize that the total evidence presented to the public hearing is the basis upon which the Board decision is made. The weighing of the *total* evidence is the concept that individuals have the greatest difficulty *understanding and accepting*. It is not just my special interest that counts: it is the whole broad total view that must be considered in the decision.

In our society we seem to be constantly subjected to a barrage of negativism from sources seeking sensationalism in the negative and rarely in the positive. The sense of balance is lost when no effort is made to present the total or at least a broader view. If the media in the interest of readability are prepared to use innuendo, platitudes, eloquent appeals to predjudice or for that matter complete distortions of fact how can we expect our Alberta public to have a broad public interest point of view.

You, through your publication can lead people to read or listen critically seeking the broad or public interest viewpoint. Thank you for the privilege of making these two suggestions for subject matter.

A.C. Dunkley Calgary

The Editor:

In the Environmental Update section of the aforementioned issue of Environment Views, I was disappointed to see the very misleading use of a photograph of land application of municipal sludge to "highlight" a note on the management of hazardous wastes. Since municipal wastewater sludge is not categorized as a hazardous waste and since hazardous wastes are not purposely disposed of by application to agricultural lands, there is no justification for using said photograph with said note. This type of presentation can only serve to mislead and unnecessarily alarm the general public which through Environment Views, I presume we are trying to enlighten.

David Spink, M.Sc., P.Eng.
Head, Special Projects
Municipal Engineering
Alberta Environment

The Editor:

In the past many people, including myself, have expressed their concerns about the end result of oil and gas exploration, notably ecological damage and irate farmers.

I noticed in your second last issue that people in the Kananaskis Country are becoming alarmed at the prospective damage that will be caused by the oil companies. However, with the possible introduction of the dirigible into Alberta, some of these fears will be squashed.

The dirigible will eliminate most problems such as constructing and maintaining roads, moving large amounts of supplies, and transporting the crude oil and natural gas, thus eliminating the need for a pipeline.

Hopefully this piece of information will help console most of the people like myself, who hate to see our lands permanently scarred.

Randy Senner Spirit River

The Editor:

I have read several articles in 'Environment Views' with great enjoyment. I was pleased to see a government publication broaching somewhat controversial subjects. I found the article entitled 'Changes in the Community' of particular interest. Thanks for supplying some good reading.

Carey Johnston

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Environment Update

Bison Trial

A controversial wildlife case involving Elk Island bison goes back to court in June, as Crown lawyers appeal a decision on who really owns Lynn Ross's bison herd.

In June 1980 Ross, a British Columbia rancher, was acquitted of illegal possession of wildlife after he shot a bison on his 810 hectare ranch near Pink Mountain, B.C. Ross claimed the animal was his, offspring of one of 47 he had bought from Elk Island National Park in 1971.

The B.C. government argues bison are now protected wildlife by a 1975 order in council.

Both Ross and wildlife officials agree that the herd, now numbering 280, is jeopardizing local moose and horse pasture. Ross, however, claims the government hasn't offered him 'reasonable' compensation. Wildlife officials argue they legally should manage the herd. The appeal will be heard in county court in Fort St. John in June.

Directory Available

Copies of a newly-published directory of persons involved in environmental research in Alberta are available free of charge from the Library, Environmental Centre, Vegreville. Compiled by J.H. Osrunn and D.W. Lee, the directory was initiated by the Research Management Division of Alberta Environment to identify environmental expertise, provide information on Alberta research projects, and aid the department in allocating research funds.

Transportation Spills

Operator error, equipment failure and driver training all play a part in spills of hazardous wastes during truck loading, unloading and transport, says a report from the Environment Council of Alberta.

Loading and unloading account for 95 per cent of spills, though total volume is small, while less frequent in-transit accidents spilled over 3000 litres in every second mishap. Eliminating accidents caused by driver fatigue or inexperience and vehicle defects could reduce the volume of wastes spilled by 20 per cent.

Construction of two hazardous wastes treatment plants would also reduce the spill risk by about one-half, says the ECA study.

Growing Your Own Food Supply

Personal food production will be featured at Fairview's third annual series of workshops on alternative styles of living, June 22-24 at Fairview College and Peace Works, Fairview.

Northern horticulture, soil fertility, herbs, beekeeping, biological control in gardens, and ecological agriculture are on the list for classroom and 'hands on' workshops. Topics are not yet final.

Registration for the personal food production workshops will be $50. Residence and camping will be available. Contact Terry Moore, NWPCEC, Fairview College, Box 3000, Fairview, Alberta T0H 1L0.

Hazardous Wastes

Alberta needs hazardous wastes treatment plants whether communities welcome them or not, says the Environment Council of Alberta.

The ECA has released 51 hazardous wastes recommendations and a report on public hearings held last spring throughout the province. Important recommendations include:

- regulation of all chemicals released to the environment, including hazardous wastes, should be brought under a single piece of legislation which would replace several others, provide for integrated planning, regulation and control, and reduce duplication of administrative staff.
- a crown corporation should be set
  operate the hazardous wastes manage
  system.
- two consolidated treatment plants sh
  be established, one near Edmonton
  one near Calgary, to reduce transport
  costs and risks.
- a site selection committee should be
  blished to oversee detailed studi
  potential sites.
- 1985 is target date for start-up o
  system. It should be able to handle
  120,000 tonnes per year. Capital
  are estimated at between 21 and 30
  lion dollars. Annual operating exp
  are estimated at between 9 and 13 m
  dollars. Charges are proposed fo
  services of the system, but an a
  subsidy by government of over a m
  dollars is projected.
- every generator of hazardous waste s
  have free access to the system for th
  2000 kg of material he sends to be tr
  each year.
- a manifest system for monitoring
  controlling hazardous wastes tran
  and disposal should be put into eff
  once.
- responsibility for regulation of the sy
  should be with the Environment P
  tion Services of Alberta Environme
  'arm's-length' from the crown cor
  tion.
- an environment trust fund could be
  to pay for cleaning up spills, aband
  sites and unexpected hazards.
- Alberta should enter into agreement
  neighboring provinces and the fe
  government for regulation of
  provincial movement of hazardous w

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contribute to Environment Upda
please send it to the editor at the a
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